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A new light seaplane, Flying Equipment.

Racing plane features now available in custom built ships by Lawrence Brown, Flying Equipment.

Menasco engines go into commercial production, Flying Equipment.

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THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

Louis F. Stoll, Vice-President

S. Paul Johnston, Editor

Leslie E. Neville, *Managing Editor* — Charles G. Cleveland, *News Editor* — Paul Wooton, *Washington*

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Let's have a look at Tomorrow's Airport

With bigger and faster transports just around the corner, and with passenger travel increasing rapidly, problems at the airport multiply

By John S. Wynne

Chief, Airport Marking and Mapping Section
Bureau of Air Commerce

DURING the last three years our knowledge of airports has increased immeasurably. With relief money available to improve and develop airports, we have had a unique opportunity for experiment. Yesterday's flying was done from landing fields lacking facilities which are demanded today, not only for the plane, but for passengers. Although tremendous strides have been made in providing adequate accommodations for both airplane and passenger, continuous effort must be applied to keep pace with future requirements.

The first necessity for a terminal airport is safety for transport operations. The Department has set minimum standards as to the length and width and number of runways necessary to obtain this safety factor. At present, few airports meet these requirements, but we are rapidly arriving at the point where they must be met or the field be withdrawn from use by transport companies.

Despite some differences of opinion and the confusing changes which are natural and healthy in an industry as young as ours, a first class airport should have three sets of double parallel hard surfaced runways, if the shape of the property will permit. One runway of each pair is to be used exclusively for landings and the other for take-offs. The interval between them should be sufficient to insure safety in simultaneous landings and take-offs.

If the field will not permit the three directional or triangular design, the prevailing strong winds should govern the layout. Runways should be 3,500 ft. long at sea level, increasing 5 per cent in length for each 1,000 ft. increase in elevation. Widths should be 500 ft., of which the center 150 ft. should be hard surfaced. The horizontal slope should not exceed one and one-half per cent. The crown should not exceed 6 in. per 100 ft. The approach to every runway should have clearance for a 15:1 glide.

The preparation of the soil or bed for hard surfacing is an interesting and intricate problem which we are attempting to solve as rapidly as possible. Recent tests have demonstrated that the normal landing load does not exceed by more than 2 per cent the static load of the airplane. From

this it is evident that resistance to the action of natural elements rather than dynamic loading is the controlling factor in design.

No one denies the desirability of concrete in most cases, but the expense involved has not permitted its free use. For this reason, we have been forced to seek good substitutes in the form of the various types of emulsions, cut-backs and tars.

In the study of bitumen treated runway surfaces it has been found that for certain types the traffic on airport runways was not sufficient to keep the surfaces "alive" by giving them the necessary kneading action. In all probability, this has caused cases of rapid deterioration and high maintenance cost.

The study of soil stabilization in connection with airport runways has proved of great interest particularly in view of its low construction cost per square yard. Since this type of soil treatment is relatively new in this country exhaustive tests are being conducted to assure adequacy of the finished product. Before the use of this particular method is undertaken, test samples should be subjected to very rigid tests for capillary absorption and stability by some recognized and approved testing laboratories. (See also page 30.)

The most important consideration in a successful paving operation must of necessity be proper drainage. For the carry-off of water on runways proper, the open type French drains along the edges are still considered satisfactory. They permit inexpensive and efficient maintenance and preserve the base soil under the hard surface, as well as preventing softening of the soil shoulders adjoining the landing strips.

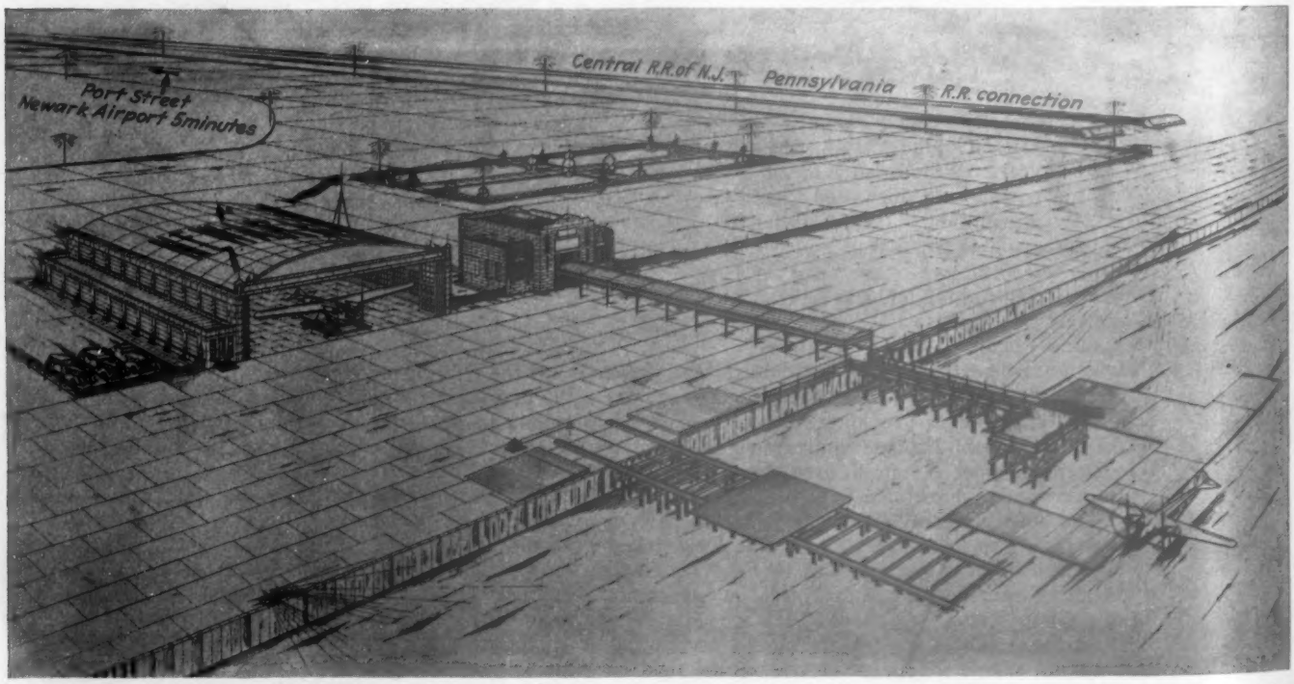
The protection of an airport against future obstructions and other hazards on surrounding property is one of the most important problems facing airport management. It is one which can be controlled under the present laws only by local zoning statutes. The finest airport in the country representing an investment of millions of dollars may easily be made hazardous or entirely useless by the erection of dangerous vertical obstacles close to its approaches. Existing hazards of this sort are not nearly as important as those which may be erected tomorrow.

Bigger planes tomorrow

Today transport aircraft development tends definitely toward larger and faster airplanes. The problem at the airport is whether or not to build hangars to accommodate the largest plane expected or whether to build them to accommodate the average plane, allowing the super-transport to remain out of doors in much the same manner as a vessel lies unsheltered in a harbor. I am inclined to believe that the latter is the economic solution. It would be easy to spend hundreds of thousands, if not millions of dollars in buildings trying to keep one jump ahead of the aircraft designers. It is already a serious problem whether or not an airport is expected to increase the height and width of its hangars every time a manufacturer brings out a newer and larger plane.

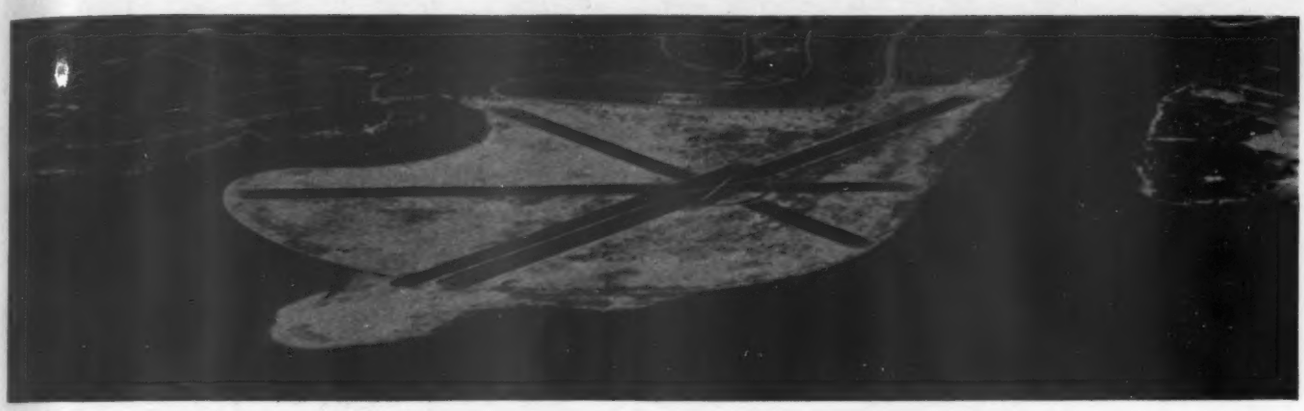
A more serious problem in this connection is the safety of the airplane itself while operating in and out of the present transport airport system. No one has attempted to dictate a policy on this as yet because it has been the desire of all concerned to allow as much freedom as possible to the manufacturer in the development and design of his transport planes. But the day is not far off when the question will have to be faced squarely from the economic viewpoint alone. The continued expansion of airports is not only expensive but, in some cases, impossible, due to the fact that many have already "run out of ground."

With the rapidly increasing interest in aeronautics in this country more and more people are looking at airports as centers for recreation or business. As at Germany's Tempelhof, people flock to Grand Central or to Dinner Key to sit down, eat and drink, and watch the planes come and go. [For a good example of how an airport makes money out of this idea see "Hitch Your Airport to the Stars," AVIATION, November, 1935—ED.] Airport buildings may also offer space suitable for governmental or business offices, as well as for operation and servicing of transport aircraft. Such opportunities should not be overlooked in planning tomorrow's airports.



Future plans for air terminals should not overlook adequate provision for the docking and handling of seaplanes and large flying boats. Here is an architect's sketch of a project for Newark (N. J.), 5 minutes away from Newark Airport. Necessities are floating loading platforms and some form of marine railway to beach aircraft. Alternate arrangement involves floating ramp with turntables (see AVIATION, January, 1935). The latter device has been used successfully at New York's East River bases at Wall Street and at 31st Street.

W.P.Airports



What has been accomplished to date in the $120,000,000 program of the Division of Airways and Airports.

WITH the practical objective of developing the nation's aviation ground facilities to a par with the rapid advance of present flying equipment, the airway and airport program of the Works Progress Administration is combining its primary mission of providing employment for men formerly on relief with the construction of necessary projects of national value and utility. The Division of Airways and Airports was formed shortly after the launching of the Works Progress Administration. This division, directed and manned by aviation personnel with engineering and construction experience, operates under the Chief Engineer of the Works Progress Administration.

The first work of the division was to plan a comprehensive national program of airway and airport development in cooperation with all interested agencies of the Federal Government, as well as state and local bodies. Wherever state organizations had worked out plans within their own boundaries, such plans were utilized in the national scheme. Such organizations as the National Association of State Aviation Officials and the National Aeronautics Association also cooperated.

The national plan embraced construction of new airports, filling and grading existing fields, construction of new runways and paving of old ones, provision for adequate drainage facilities, construction and remodeling of hangars and administration buildings, installation of adequate field lighting—including beacon lights—and such airway radio facilities and other aids to navigation as were adaptable to the work relief program.

Putting men to work

A necessary factor in the entire program has been the merging of the comprehensive national plan with the availability of relief labor, since the employment of large numbers of the unemployed who formerly were on the dole has been the direct objective of the Works Progress Administration.

Profiting from experience gained in earlier work relief programs, construction was divided into useful units. If changes in the work relief conditions prevented completion of an entire project as proposed, the units which had been started would be placed in a safe and usable condition. Thus the program has been protected from unfinished work which might conceivably leave an airport in worse condition than before work began. Care is taken to release and start construction only on those units of a project which can be completed within the period for which funds are allotted and for which there is a clear indication of availability of sufficient workers.

Up to May 15, 1936, a total of 547 projects had been released for operation, of which 372 projects were active on that date. Work had not yet been started on 64, temporarily suspended on 45, and had been completed on 47. On that date $26,296,831 had been authorized as available, of which $3,596,046 is being contributed by the sponsors. The applications requesting funds for these projects totaled $68,619,131.

Step by Step

Procedure in the development of a project from inception to construction is briefly as follows:

The local sponsor (which must be a public body) prepares the project proposal and plans and secures approval of the Works Progress Administration district director and the state administrator. The field representative of the Bureau of Air Commerce is available for preliminary advice to the sponsor and, if the project involves less than $50,000, he can approve it in the field for the Bureau. The state administrator then submits the project to Washington.

After being checked at the Works Progress Administration headquarters and by the Director of the Budget, it then is submitted to the President. If approved by him it appears in a Presidential letter and then goes to the Comptroller General who issues the warrant.

Projects which have thus been ap-

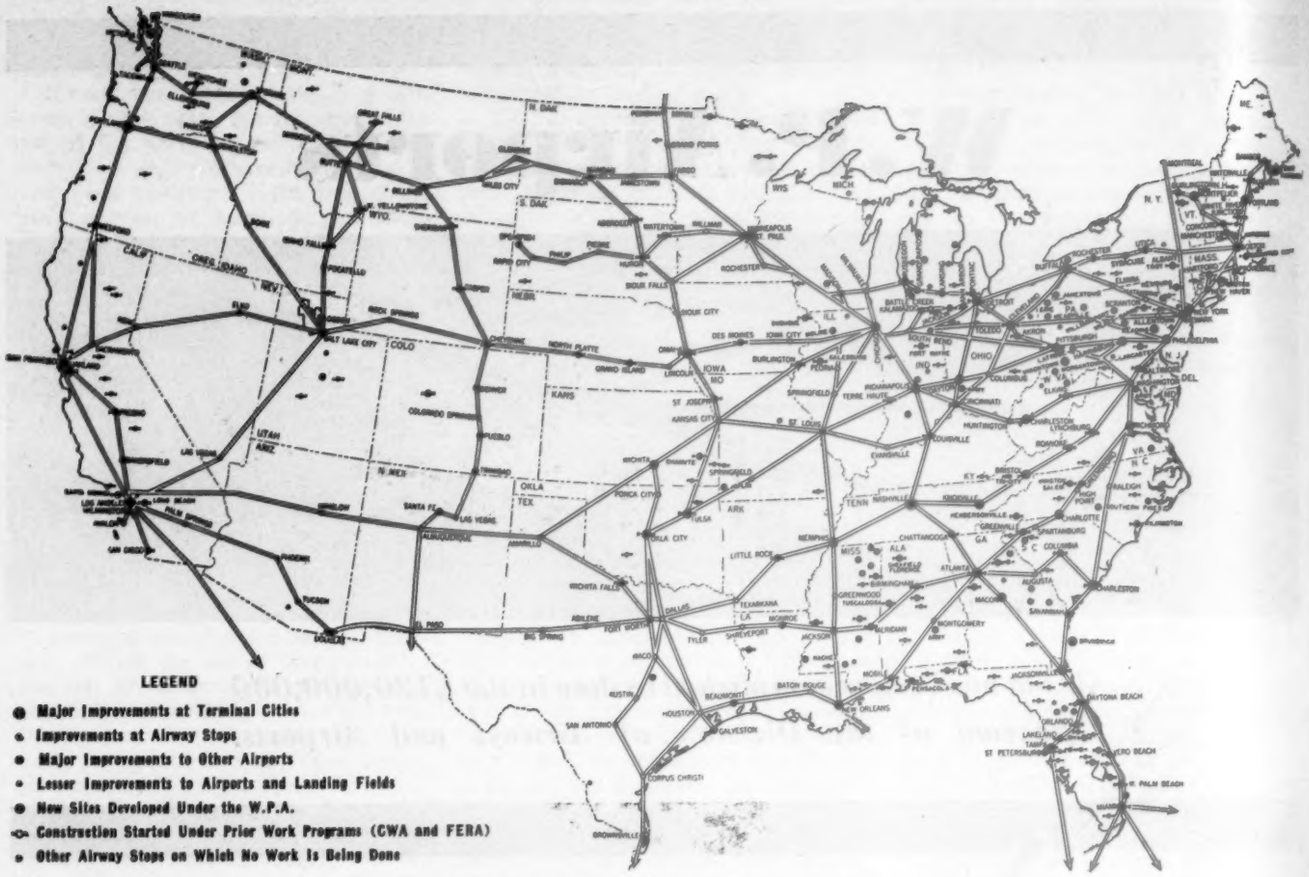

LEGEND
Major Improvements at Terminal Cities
Improvements at Airway Stops
Major Improvements to Other Airports
Lesser Improvements to Airports and Landing Fields
New Sites Developed Under the W.P.A.
Construction Started Under Prior Work Programs (CWA and FERA)
Other Airway Stops on Which No Work Is Being Done

Fig. 1: Improvement has followed the airways.

proved and have cleared Washington are then referred to the Works Progress Administration state administrators. Meanwhile the project is being studied and, if aeronautically proper, is approved by the Department of Commerce. These projects then form a group from which the state administrator, acting upon the advice of his district and local officials, selects those which appear most suitable for immediate release of funds for prosecution of the work. Thus local conditions affecting the available labor and the desirability of any particular project receive their proper consideration.

Procurement of materials is handled by requisition through the Procurement Division of the Treasury Department represented in each state by a finance officer. The sponsor's advice is duly considered. The sponsor may have available materials to contribute as his share of the work. While the sponsor's specifications for certain types of equipment must be within the financial limitations of the Works Progress Administration regulations, it has freedom to contribute more costly materials at its own expense.

Specifications for equipment are generally on a performance basis. Although the Procurement Division of the Treasury may purchase equipment for more than one project at a time, the requisitions originate in the field.

While it is the basic practice of the Works Progress Administration to put as many men to work as possible under a well directed program, expenditures for materials directly benefiting the industries concerned have been considerable. Up to April 30, 1936, a total of over $3,000,000 covers purchase of materials, including paving material, hangars, lighting equipment, markers, etc.

Where money is going

The map, Fig. 1, indicates the location of sites on which active construction is under way. Much of this work consists of improvement directly on the airway system. The original airways were developed to connect the chief traffic centers, and it is logical that this development should continue together with the improvements of sites suitable for future branch or feeder systems. States in which state aviation officials have developed their own plans tend to lead in the present construction program. However, the nature of the terrain in many of these states is such as to require prepared landing places for safety.

Fig. 3 shows how, generally speaking, the area of the greatest airway traffic density coincides with the volume of work and employment on airport projects. Fig. 2 indicates the extent of the airmarking programs which are not given consideration in Fig. 1. Airmarking programs have been approved in nearly every state and a number of these are active at this writing.

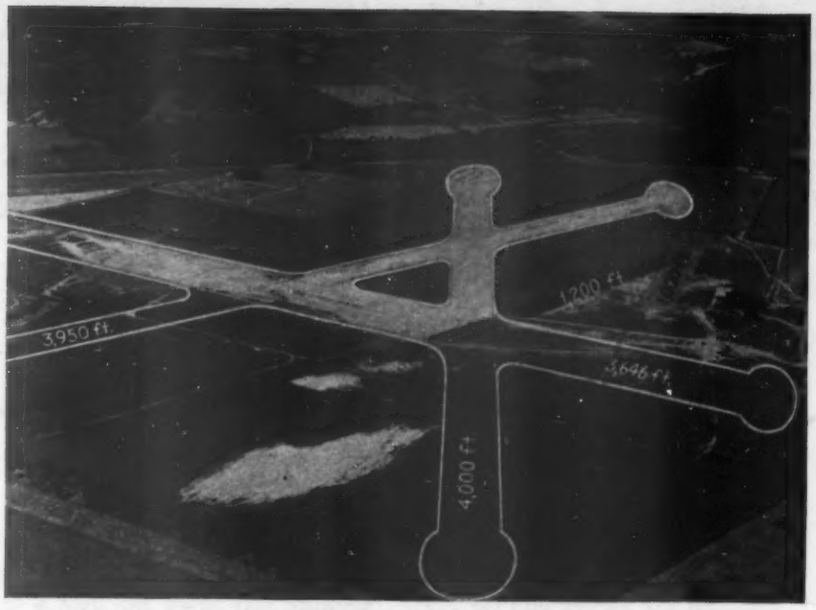
A cardinal principle of the Works Progress Administration is the completion of numerous projects started by earlier work relief activities of the Civil Works Administration and the Federal Emergency Relief Administration. While a number of projects were completed under these earlier programs, much of the work accomplished could be listed as improvements to existing landing fields. The present Works Progress Administration plan has undertaken to improve further certain of these fields to a status sufficiently developed to permit their being termed "airports." During the past five to eight years a great many landing fields were called "airports" even though they were principally undeveloped pasture land or other cleared fields. Fig. 1 indicates locations where work started under the prior programs is being continued under the Works Progress Administration. Present regulations require that airport land be publicly owned before a project is eligible for construction, which prevents continuation of work started at some sites under the earlier programs in which the Federal Government had made direct work relief grants to the states for purely state determination of the nature of the work. Many towns have now ac-

quired land on which earlier projects were worked—now making them eligible under present regulations.

Then and now

In these earlier programs there was considerable variation in the volume of airport work done among the states which should be taken into consideration in connection with the present program. For instance, in the state of Kentucky there are only two locations indicated as active in the present program, but there were seventeen sites developed under the prior work programs in that state.

Up to April 30, over 1,600 airway and airport projects, involving $120,924,619, have been approved at Washington by the Works Progress Administration and returned to the state administrators for final selection. It should be clearly understood that such approval merely makes those projects eligible for selection by the various state administrators for release and construction.



What is being done at Harrisburg, Pa.—a typical airport development project.

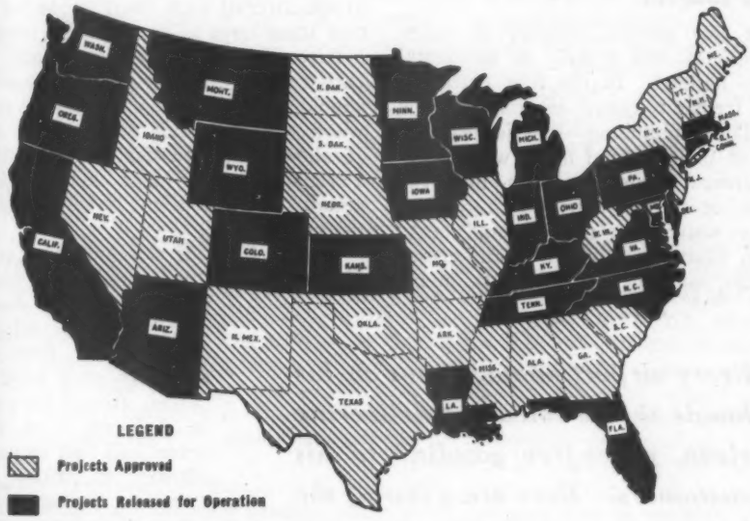


Fig. 2: Airmarking projects are active in nearly every state.

The need for providing prompt employment made it necessary to start some of the projects before the sponsor had completed all details of the plans. The general layout having been determined, work such as clearing and grading and drainage was approved and went ahead while the sponsoring towns were drawing up detailed plans for hangars, lighting, et cetera.

Alabama's "Airparks"

In some states, notably Alabama, the airport program has been combined with construction of recreation facilities. In Alabama the term "airpark" is used to denote the combination of an airport with a park area. The recreational facilities in no way interfere with the proper handling of air traffic, while they do provide a type of beautification highly beneficial to the airports. Also, they tend to make the airports a gathering point of the community as well as providing golf and other facilities for visiting flyers, and of extreme importance, provide a means of insuring operation and proper maintenance of facilities during the period flying is not so extensive as it is expected to be. The "airpark" is particularly suited to the smaller community.

Eight or ten years ago the American Legion in Alabama succeeded in establishing 26 landing fields, on two of which recreational centers were built. In 1933, when the Legion again checked up, they found all but these two had not been maintained. So, these two, on which other activities combined with flying, had been so successful as to lead to further development of the "airpark" plan.

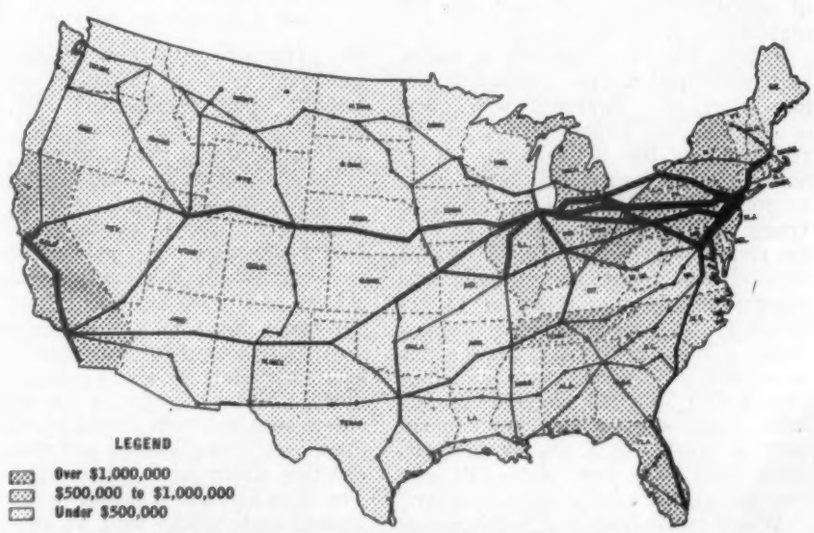


Fig. 3: How the volume of work coincides with traffic density (Authorized expenditures, Federal funds plus sponsors' contributions).

Water

So it's a good idea

A BIG transport, every seat occupied, taxies out over the runway, gathers speed, climbs off the airport into the night and up over the mountains, her nose pointed toward a destination 600 miles away. Propellers are turning over smoothly, and last-minute inspection by a corps of mechanics has insured that everything is in proper running order. Suddenly, however, the steady roar of the big engines is interrupted. They sputter, cough once or twice, die out altogether. Passengers sit rigid in their seats, staring at each other across the silent cabin. Pilots forward work frantically with throttles, starters and fuel valves. The big ship noses downward in a swift glide to make a precarious "belly" landing in a little clearing among the pine trees in the bottom of a pass. Fortunately nobody is hurt, but the company has an $80,000 airplane reduced to junk and a dozen shaken passengers leave the spot with a large dent in their faith in air transport.

What happened? Just a little slug of water that got by every one and into the gas tanks carried with it the seeds of potential tragedy. Of such are the nightmares of airline operators.

Plainly, here is a problem of major importance, and one not confined to airline operators. Everyone who owns or operates an airport shares in the responsibility for its solution. It is nothing to be considered lightly, for, as pointed out elsewhere in this issue (page 25), negligence on the part of the airport operator in the delivery of contaminated fuel which results in subsequent damage to aircraft or to bystanders, lays him open to damage claims. There are ways to avoid water inclusions, or to detect them once they have gotten into fuel supplies. In few other places can the old "saw" be applied as directly as in dealing with aircraft fuels, for here above all else "eternal vigilance is the price of safety."

Water contamination of fuel is almost entirely a byproduct of handling and storage methods. Gasolines leave the producing plants absolutely dry, but there are many places between the refinery and the carburetor jets where moisture may creep in. Not a single one may safely be overlooked.

Water sources

The two general sources of water may be classified broadly as accidental and as natural. In the first category, most frequent cause of inclusion is from faulty plumbing—that is, leaks in pipes or underground tanks which permit ground water to seep into the system, or the introduction of rain or surface water into underground tanks due to faulty location or maintenance of tanks, manhole covers, vents, plugs, etc. The only protection against such accidental types of inclusion are inherently sound engineering and construction in original installations, plus continuous careful maintenance.

Every airport manager has on his hands the problem of delivering clean, water-free gasoline to his customers. Here are a few of the latest ideas on how it can be done.

The chief cause for natural water inclusion is condensation. Under a wide range of conditions, moisture-laden air drawn into tanks or plumbing deposits moisture on walls which eventually collects in droplets and slides down into the fuel. Even in a small system a surprising amount of condensed water may accumulate in a surprisingly short time. (This, of course, is the primary reason why airplanes should be refueled immediately after landing and never left standing about with half-empty tanks. The same precaution should be observed toward tank trucks used at airports.) Good original construction and careful maintenance of storage tanks is therefore no assurance that water-free gasoline will be delivered into an airplane's fuel tanks. For this reason there are good grounds for the argument that some form of water separator should be built into the receiving end of the aircraft tank itself or, better yet, that some form of separator be installed between the gasoline tank and the carburetor. Such a device, however, should be designed so that an excess of water will not shut off the fuel flow. It should also be drainable in flight. Perhaps a centrifugal device, like a cream separator might be developed for the purpose.

The problem of straining fuel at the airplane tanks is complicated by an ever-increasing demand for higher refueling speeds. To meet fast schedules over long distances, ground time must be reduced to a minimum, and fuel cannot be allowed to trickle into tanks through filter paper. Gasoline must be pumped in at speeds between 50 and 100 g.p.m. Nothing may be introduced into the picture to slow down refueling processes.

The old idea of putting gasoline through a chamois is frowned upon in this country, although it is still used abroad. At best, chamois is only about 50 per cent efficient. It may be fairly satisfactory when new, but it deteriorates rapidly, passing more and more water as time goes on. It also introduces a fire hazard, for unless properly grounded, static electricity may collect and cause a spark. For small operators, special filter funnels such as the Gilbert & Barker Bucket type are effective They may pass as much as 40 g.p.m., and are better than 95 per cent efficient on water removal. (Other types are illustrated in the Airport Equipment Supplement.)

There is one very fortunate element in the problem and that is the fact that

Won't Burn

to keep it out of gasoline

By
S. Paul Johnston
Editor, AVIATION

gasoline and water do not mix. If they did, the whole problem would become immeasurably more complicated. Fortunately, also, the differences in specific gravity are so great that globules of water which might be pumped into gasoline tanks, sink quickly to the bottom, coalesce and accumulate at the lowest point in the system. The most obvious "out" therefore, is to provide a sump in every fuel tank fitted with a manually operated drain cock. After every fueling and before every take-off, the sump cock should be opened and any water drained out. This is now the rule on most airlines, in spite of any precautions which may have been taken to deliver water-free gas to the tanks. It is a good idea for every airplane manufacturer to equip his tanks with such a sump and a better idea for every pilot who flies to make use of them. This little precaution may save an expensive crack-up or even the pilot's neck.

The same precautions should be applied to underground or other storage tanks. Storage tanks of all types should be so pitched when installed that all water will drain to a sump in one end. A pump connection should be provided at the low point so that water may be removed periodically. Each tank should also be provided with a large manhole by which it may be entered for inspection. *But no one should ever be allowed to enter such a tank without a gas mask.* Periodically, fuel from the sumps should be pumped or drained into a glass receptacle and inspected for water content. Another method which should be used daily along with the visual inspection is the use of a special litmus or "water indicator" paper put down into the tank with a measuring stick.

Some storage tanks are equipped with float-type suction pipes. This equipment usually consists of a suction line provided with a swing joint on one end and a float on the other. The float keeps the suction end at or near the surface of the fuel and prevents drawing into it any water accumulation which may be in the bottom of the tank. Another device for the same purpose but of a different type is the Veile foot valve manufactured by Swift of Elmira. This relatively simple float valve has been found to be effective and has been adopted by a number of airlines.

Centrifugal separators, such as those manufactured by Bowser or Steel Products Engineering Company may be installed between the fuel pump and the delivery hose as an added precaution.

A warning

In the maintenance instructions of one of the larger airlines occurs the following pertinent precautionary paragraph "It is normal to find a small amount of water in gasoline storage tanks, and in the event a tank consistently has no trace of water in sumps or in traps, the entire system should be thoroughly investigated. In such a case, it is possible that the suction lines might be too close to the bottom of the tank and be sucking all of the water out along with the fuel. The lack of water in (storage tank) sumps in this case constitutes a false indication of security."

Going back to the problem of filling airplane tanks Major R. W. Schroeder, Chief of the Air Commerce Bureau's Airline Inspection Service, has made an interesting suggestion which is now under development. Ordinarily, aircraft tanks are filled from the top which requires that a mechanic climb up on the wings. This results in damage to wings and the spillage of gasoline over wing structures. Two men are usually required, one on the wing and one on the ground. Major Schroeder proposes a tank with arrangements to be filled from below by providing a Babcock connection on the underside. One man with a hose could make the connection and at the same time manipulate the pump control. Adjacent to the Babcock connection would be an overflow pipe that would extend up into the tank. This pipe would not be fixed, but could be moved vertically. It could be calibrated and marked on the outside with graduations indicating the amount of gasoline desired in the tank. The overflow pipe would be set to the proper graduation, then the fuel would be pumped into the tank through the Babcock connection until it just started to come down the overflow. After filling, the overflow pipe would be pushed all the way into the tank and suitably secured.

This scheme has a number of advantages, including one-man operation, freedom from damage or spillage and freedom from introduction of rain or snow or dust into the open filler opening on top. A strainer-separator system could be applied to keep out dirt. Two hundred mesh screen or finer would do the job. By simply opening the Babcock connection in the bottom of the tank, a reverse flow of gasoline could be relied upon to force dirt, etc., off the screen.

Pits or tank trucks

There are still two schools of thought on the proper method of getting fuel out of storage and into airplanes. Both have their advantages. In the fixed underground system, fuel is pumped from main storage tanks out to pits located at convenient points about the field or hangar aprons. (See Airport Equipment Supplement.) In this case the airplanes must be brought to the pit for refueling, but since transport airplanes must be brought to fixed points on airports for loading passengers or cargo, this idea does not entail any great inconvenience. The pits may be located adjacent to the loading point. All fueling equipment is completely underground when not in use. Electrical outlets, compressed air connections, fire extinguishing equipment and portable lights are usually available in the pits.

The other system involves the use of tank trucks to transfer fuel to aircraft. With the truck system it is possible to service a whole line of air-

craft without moving any of them. This has its advantages on certain commercial fields and on military fields where a large number of airplanes must be fueled in a minimum of time. In designing trucks, however, the same precautions against water inclusion must be followed as for underground systems. Water separating devices—such as the Viele valve, or units of the centrifugal type, may be built into the suction and discharge lines. At least two major airlines have written very complete specifications for tank trucks for servicing their ships and equipment is now under construction against the specifications.

Conforming with the specifications worked out by the airlines the Columbian Steel Tank Company (at Kansas City) has designed mobile fueling and servicing units of which a typical example is shown in the accompanying drawing. The specifications for this particular truck call for an 800-gal. three-compartment oval-shaped tank, mounted on a suitable truck unit. At the rear of the truck over the wheel box is a housing for an adjustable flood light controlled from a switch in the cab. In front of the tanks and at both sides are two Alfite No. 10-S CO_2 fire extinguishers. Compartments are provided below the walkways to receive a standard TWA (or equivalent) Douglas mounting ladder. In the reel box are mounted two hose reels side by side, independently operated, each to accommodate 75 ft. of 1½-in. gasoline hose, with wet nozzles. Two meter and strainer combinations are mounted side by side near the rear doors. Meters have sloping faces and illuminated dials. Two 2-qt. hand fire extinguishers are mounted inside rear doors. Seventy-five feet of metallic cable on a reel are provided for grounding the truck unit to the ship being serviced. A trailing grounding chain is attached under the reel box. Curb-side cabinets are installed for storing lubricating oils. They are heated with hot air tubes connected with truck exhaust, but an electrical heating element also is provided for use when truck is idle, with suitable connection for outside 110-volt current supply.

A special sump is built into each compartment for segregation of water and other foreign matter, with pipe connection to visible gages in the reel box.

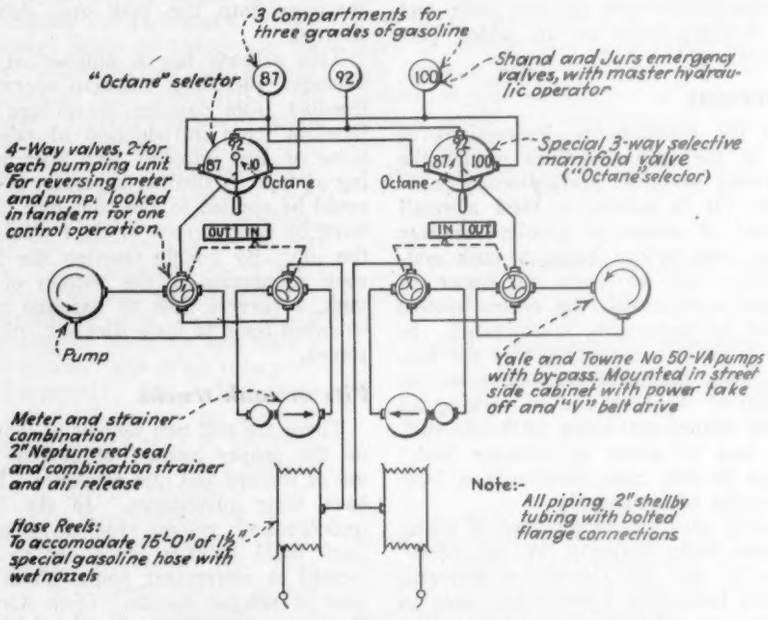
Piping and valves are arranged so that any one of the three tank compartments may be connected to either reel. Selector valves are installed instead of the usual hand operated valves, so that there can be no question about which compartment is being discharged or filled. This, of course, is important when handling two or three grades of gasoline. The piping diagram indicates the arrangement of the selector valves. An important feature is the reversibility of the pumps, making it possible not only to deliver fuel from the truck to the airplane, but also to withdraw fuel from the plane and return it to the proper compartment in the truck. This, of course, is important in making final adjustments on weight schedules before flight. Selector valves marked "in" or "out" automatically take care of this feature.

Fueling units of this same type are available also in other sizes. The 800-gal. outfit described was designed for Sinclair Refining Company. A design has been worked out for a 2,500-gal. unit of the trailer type for the same company.

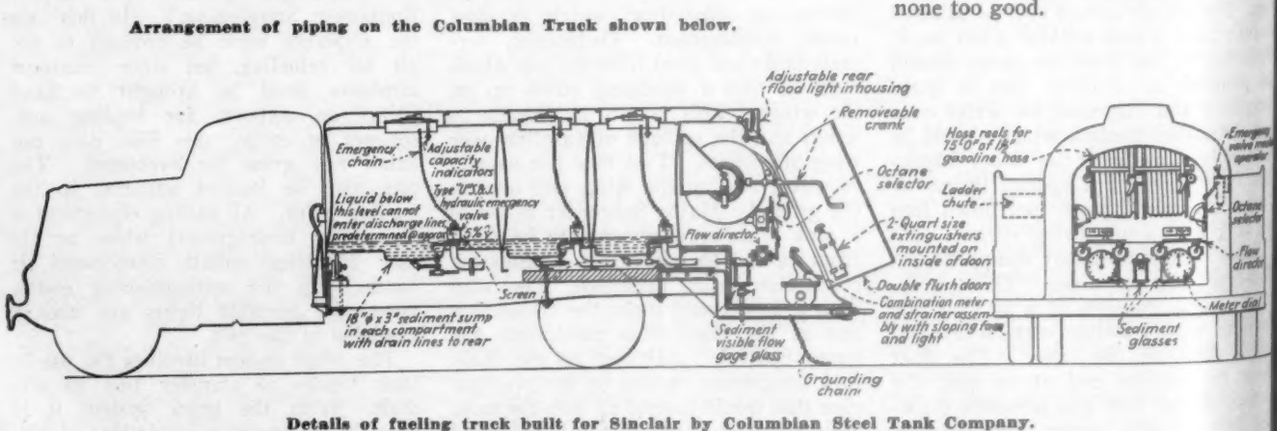
A generally similar unit, but designed for 1,500-gal. capacity has been built for Standard Oil of New Jersey and is now in service on American Airlines. This unit is capable of loading or discharging two grades of fuel simultaneously at the rate of 45 g.p.m. each at a point 20 ft. above the truck.

The Texas Company has also six tank truck units under way for airport use. Details are somewhat different in treatment but the basic specification is the same as that laid down for the Columbian trucks.

Of course it is not necessary for smaller airports to go to the elaborate equipment outlined above, but the general precautions which have been considered in its design apply to the handling of fuels at even the smallest field. No operator can afford to overlook any bets in handling or storing gasolines. At all times the closest attention that can possibly be given is none too good.


3 Compartments for three grades of gasoline
"Octane" selector
87
92
100
Shand and Jurs emergency valves, with master hydraulic operator
4-Way valves, 2-for each pumping unit For reversing meter and pump. Looked in tandem for one control operation.
Special 3-way selective manifold valve ("Octane" selector)
Octane
Octane
OUT IN
IN OUT
Pump
Yale and Towne No 50-VA pumps with by-pass. Mounted in street side cabinet with power take off and "V" belt drive
Meter and strainer combination 2" Neptune rod seal and combination strainer and air release
Hose Reels: To accomodate 75'-0" of 1½" special gasoline hose with wet nozzels
Note:- All piping 2" shelby tubing with bolted flange connections

Arrangement of piping on the Columbian Truck shown below.


Adjustable rear flood light in housing
Removeable crank
Emergency chain
Adjustable capacity indicators
Liquid below this level cannot enter discharge lines predetermined @ approx 5%
Type "U.S.B." hydraulic emergency valve
Hose reels for 75'-0" of 1½" gasoline hose
Octane selector
Ladder chute
2-Quart size extinguishers mounted on inside of door
Flow director
Double flush doors
Combination meter and strainer assembly with sloping face and light
Screen
18"ø x 3" sediment sump in each compartment with drain lines to rear
Sediment visible flow gage glass
Sediment glasses
Grounding chain

Details of fueling truck built for Sinclair by Columbian Steel Tank Company.

The State Airport

A Symptom

By
Willard M. Fletcher
Chief, Division of State Airports
State of Rhode Island

Rhode Island State Airport from the air.

Willard M. Fletcher

UNDER what political subdivision should the construction and maintenance of ariports be placed? This question has arisen in the minds of many forward looking airport advocates. We have just passed through a period of municipal airport development and there have been many incidental headaches. After all an airport serves not only the population of a municipality or a state but the population of a nation. The expense of airport construction and maintenance, therefore, best can be borne by the largest political subdivision under which it is practical to place it. Rhode Island is pioneering that policy.

As early as 1925 Rhode Island was rather rudely awakened to a realization that her facilities for aviation were deficient but it was not until 1929 that the appropriation of $300,000, for the State Airport was forthcoming.

A site of 411 acres was acquired by the five-member commission set up to administer the act, but 165 acres was considered sufficient for the field, the remainder being kept in reserve for expansion and to control obstructions. After the work of the first commission was completed a second one consisting of three men was appointed in 1932 and a five-year development program for the airport was evolved. The advent of the Federal Public Works Administration early in 1933 changed the five-year plan into a one-year program. Cooperation of the State Highway Department provided preliminary engineering work on the drainage and general contours.

Runway layout was determined after a series of conferences between the commission and many representatives of the aviation industry. Specifications for the construction work were submitted to aviation authorities and approved by the Bureau of Air Commerce before submission, with 27 other public works projects, to the voters of the state. Endorsement of the airport was second only to a hospital project. The state assumed its 70 per cent obligation and the PWA gave its 30 per cent grant without hesitation.

Without further delay the State Emergency Public Works Commission employed engineers to supervise the carrying out of the project to its conclusion. The initial contract providing for grading, drainage, and construction of runways and taxi strips, was awarded to the Lane Construction Corporation of Meriden, Conn., the low bidder. Later contracts involved installation of lighting, runway localizer, and the seeding of earth areas. Successful bidders were the New England Machine & Electrical Company of Pawtucket, R. I., and Woodworth Bradley, Inc., of Providence, R. I.

Total cost of the airport including land, development, and maintenance for the four-year period during which it has been in operation, is so much less than a million dollars that another good airport could be built with the balance. It consists of three concrete runways, each 3,000 ft. long and 150 ft. wide, and a concrete apron 1,400 ft. long, 150 ft. wide and connected to the ends of the runways by taxi strips of bituminous penetration construction which are 40 ft. in width. Due to the absence of obstructions to the six lines of approach, every inch of the runways is available. For those pilots who do not care to land on pavement, due to technicalities in the design of certain airplanes, there is available over one hundred acres of turfed area, with a maximum grade of 0.4 per cent.

The result of the efforts of those determined to have Rhode Island accept and foster aviation is a port available for all the world to use, and to date it is completely equipped to meet any maintenance or operations requirements.

If other states would take a cue from conservative little Rhode Island, which has more than once pioneered sound policy in this country, and each build one State Airport, the cause of aviation would be greatly enhanced.

Western Electric Company

Only by constant watch over all ship movements may traffic be handled safely at busy airports

"Go Ahead,

TRAFFIC CONTROL is as necessary along the airways as it is along the railways to reduce chances of collision, to obtain a continual check on positions, and to enable more economical dispatching and routing of equipment. Air traffic control is most necessary during the hours of peak activity at major air terminals when a number of airplanes converge from diverse directions at the rate of three or more miles per minute, while other airplanes may be taking off at the same time. All of them may be changing altitude simultaneously. Chaos would inevitably result without some governing and restraining influence, particularly under conditions of poor visibility and low ceilings.

If control is to function efficiently in unfavorable weather, however, *it should be practiced during favorable weather.* It is useful under all conditions to avoid congestion and confusion, permitting an orderly sequence of take-offs or landings and minimizing wasted time. Time wasted in the air in waiting to land, for example, costs a modern operator about $1 per minute.

With the support and approval of the Bureau of Air Commerce, the airlines are establishing offices to control airways traffic at all important airports. Each Airway Traffic Control Office (ATCO) is an independent corporation at each airport with a Board of Directors consisting of the station managers of each airline on the field. The methods of control have been worked out by Earl Ward at Newark. He has since been appointed Supervisor of Airways Traffic Control for the Bureau of Air Commerce and the system he developed at Newark will be used at other major terminals such as Chicago, Cleveland, Pittsburgh, Washington. July 1 the Bureau announced that it would take over operation of the Airways Traffic Control Offices, which the airlines at each terminal have been supporting, and expand them into a national system.

Although the system was designed for airline use, it is available also to the government services, itinerant pilots, military services and all who use the airways. All non-scheduled pilots should cooperate with Airways Traffic Control. By so doing, they will help themselves as well as the airlines. It is only necessary to submit a flight plan to the ATCO *before* take-off in both good and unfavorable weather. This is mandatory for intentional instrument flights, always compulsory for scheduled airlines, desirable for all other plane movements.

The present measures controlling airway traffic are based on the Bureau of Air Commerce Notice of Nov. 15, 1935 (Air Commerce Bulletin Dec. 15, 1935) and on inter-airline agreements approved by the Bureau (Air Commerce Bulletin, April 15, 1936), of which that covering Newark is typical.

Inter-line safety agreement

The Newark Inter-line Safety Agreement requires that: "Any pilot before departing on a flight for any purpose must first give to the airport control tower and to the airway traffic control office a flight plan." The essential elements of the flight plan are time of departure, cruising altitude, cruising speed, estimated time of arrival, and the time and altitude of passing the radio markers. While the Notice of Nov. 15 applies only to intentional instrument flying, the paragraph requiring a flight plan will probably apply eventually to all airplanes using the airways at any time. Radio equipment, too, will eventually be required for all airplanes using airline airports or airway facilities.

General procedure

Along each airway there are certain radio check points ("fixes,"—which may be the intersection of two radio beams or a radio marker) over which the airline pilot radios to his company's office at destination his altitude and exact time of passing over. The last "fix," the one nearest the airport, is called the *"inner radio marker."* When a pilot passes over the last fix *before* the inner radio marker he radios ahead the time he expects to pass the inner radio marker, and the altitude which he would like to fly over it. These communications are between the pilot and his company's dispatching office. The dispatching office communicates all flight information over an interphone system to the Airways Traffic Control Office. This office gives the dispatcher any information which may be useful to the pilot to fly at his desired altitude, or

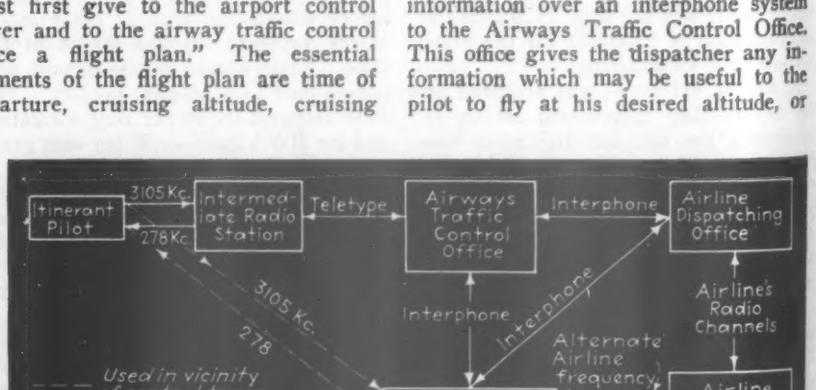


Fig. 1. Four agencies now control the movements of scheduled airliners.

Newark"

By
Jerome Lederer
Engineering Division,
Aero Insurance Underwriters

Western Electric Company

gives instructions where to "lay off" (position and altitude) for further instructions if for any reason the pilot should not come in to land right away. The airline's dispatcher transmits this information to the pilot. If, due to radio trouble or other causes, the pilot should be unable to request or secure approval of an altitude over the inner radio marker, he automatically assumes an emergency altitude which is always held open for his airline over the marker. This altitude is held open until the airplane is definitely located. The pilot proceeds to the airport at the emergency altitude.

After the pilot has reported from the inner radio marker, his dispatcher notifies the ATCO, which then "clears" him in (tells him, via his company office, that it is all right to fly from the marker to the terminal). Between the inner radio marker and the airport, the pilot gets in touch with the control tower (on his alternate company frequency, night frequency if flying during day and vice versa) to receive data on the traffic around the field, wind direction and velocity, barometer reading, field conditions and clearance to land. Airways Traffic Control Office keeps the control tower informed of all airplanes approaching from the inner markers. Thus there are four agencies engaged in the control of each scheduled airplane: The pilot, the pilot's dispatching office, the Airways Traffic Control Office, the control tower. (Fig. 1.) In thick weather, the control tower does not take charge until the airplane is visible over the field, any instructions to that time being given by the airline's dispatching office and Airways Traffic Control Office. The pilot at that time is so busy following the beam and attending to other chores that he has little opportunity to talk with anyone. The new type of radio beam which permits voice to be superimposed on the signals, or the system which permits simultaneous reception of the radio beam and voice on different frequencies should help him in this situation.

Itinerant pilots

Generally speaking, itinerant pilots cannot communicate with terminals at as great a range as do scheduled airline pilots because of limitations of their sending sets. Also the range of the ground transmitter at airports is limited (to avoid interference with other ground station communications). The Federal Radio Commission has set aside 3,105 Kc for transmitting messages from the airplane to the ground station and 278 Kc for messages in the reverse direction. With only one frequency in either direction tremendous confusion would be created unless the transmission ranges were limited. The itinerant gives his periodic position reports to the Department of Commerce intermediate ground stations, or to the airline intermediate stations who are presumed to be listening on 3,105 Kc. They teletype the airplane's position, altitude, and time-over to ATCO. They also can radio any special information to the airplane over 278 Kc. This might be called decentralized communication. If the ship does not have two-way radio, this service is available only if the ground station is on the lookout for the airplane.

The control tower radio is limited in range so that it will not interfere with other radio communications on 278 Kc between nearby fields and the pilots. When talking to the control tower the airline pilot uses the alternate airline frequency (night frequency during the day and vice versa) to prevent congestion on the airline frequency being used by his company to direct other pilots.

Outgoing airplanes interest the Airway Traffic Control Office only to the extent that the altitudes and time of passing over the inner radio marker must be known to transmit this information to the approaching pilots and to the Airway Traffic Control Office at destination and to be sure that the pilot has followed his flight plans. Once beyond the inner radio marker, the progress of the airplane becomes the interest of the distant control office.

If the inter-airline agreements are followed the possibilities of collision between scheduled planes *along the airway* are remote. But the Airways Traffic Control Office is not so much concerned with preventing collision *along* the airway as in the vicinity of the inner markers, points on which airplanes are converging.

Traffic density

Newark Airport has 64 scheduled arrivals and 64 scheduled departures per day. Added to this are extra sections, passenger hopping, Army and itinerant pilots and instruction flights. The peak loads occur between the hours of 4 and 8 p.m. when there are as many as twelve scheduled movements per hour. Some of these are very closely spaced. Delayed departures and extra sections may increase the density. The Newark ATCO is arranged to have the full complement of four men in the office during hours of greatest traffic density. At such times they work with dramatic

intensity. Conditions at Chicago are similar with 47 scheduled arrivals and 47 scheduled departures per day plus an average of about 35 miscellaneous daily movements. It is worth noting that no student instruction is allowed at Chicago and that 70 per cent of the miscellaneous ships are equipped with one- or two-way radio. Receiving sets are required on passenger-hopping trips.

When thick weather and/or delays in landings increase the congestion of traffic in the air, Airways Traffic Control Office assigns definite locations and altitudes to each airplane. The altitudes are staggered so that each airplane circles or flies back and forth along paths separated by a horizontal and a vertical distance from every other airplane. As the ships land, each ship in order is stepped down to the next altitude until it is ready to come in to land. The position and altitude of each ship is marked on a small chart of the airport and its vicinity.

ATCO organization

The Airway Traffic Control Office organization is responsible only to the airlines who own it. Periodically the Board of Directors (airline field managers) meet to discuss the progress of the organization and to air any mistakes that may have been made by the ATCO or by pilots. Control towers are not under the jurisdiction of the organization at present.

The personnel employed for ATCO are usually experienced airline dispatchers or control tower operators or pilots with considerable airline experience. Four men are usually on duty during the busiest hours: One man calculates the true ground speed of the airplane with a circular slide rule—a second moves the little markers on the map showing every fifteen minutes the change in position of all airplanes on the airways leading into the field; a third gives information and directions to the airline dispatchers and control tower over the interphone, he also keeps the logs, and chalks information on the blackboards for the others to see; a fourth man stands by to catch any mistakes or lapses and acts as a check.

The equipment consists of a teletypewriter to get messages regarding itinerant pilots and to receive weather reports at the inner radio markers; an interphone connects with the airline dispatching offices and with the control tower; an aeronautical chart, 16 miles to the inch, shows the radio ranges, airways, radio fixes and other navigational data; little markers on which are noted the airline, trip number, points of departure and destination, altitude and true departure time are moved along the airways.

Two other important pieces of equipment are the ruled blackboards one of which is the "Position Reporter" and the other the "Inner Marker Reporter." A dictagraph to record all verbal communications, orders, information received and sent out is being tried. The times of all scheduled departures and arrivals is also posted.

A busy man

There are some weak spots in the present system of control but these are the faults of personnel relationships and equipment rather than the system. The control tower operator has too much to do during hours of greatest traffic density and there is little hope of reducing his work. He must talk over and listen to the interphone and at the same time to the four or five radios (one for each airline and one for 3,105 Kc), he must continuously survey the field and the air, he must give directions and information to incoming and departing pilots, (by a light gun if there is no radio in the ship), he must keep a log of arrivals and departures—and sometimes he must do all this, including the listening to several radios, simultaneously! Furthermore, it is difficult to share his work with an assistant because during rush hours there is no time to coordinate information and procedure between two minds—one brain must do all the work. Thus the limiting factor for control near the airport is the capacity of the man in the control tower. His brain will reach its saturation point long before the physical facilities of the airport. When the demand for control exceeds his ability to give it, the intensity of traffic must be reduced either by delaying schedules or transferring schedules to other airports.

The control tower man should be relieved after about four hours of such intense work, by a fresher mind; the routine might be similar to "watches" on shipboard. Control towers should be air conditioned and made as comfortable as possible. The control tower officer should be qualified for his work by experience, he is responsible for the lives of the public and therefore should be required to have a license for the job—just as are civil engineers, doctors, stationary engineers, and pilots. At present the control tower men are employed by the operators or owners of the airports. They do not come under the supervision of the ATCO or of the Bureau of Air Commerce. While they cooperate with the ATCO they are not compelled to do so. Such division of authority is not in the best interests of safety. Perhaps there should be a *Federal* Superintendent of each Port for the Interstate Air Terminal and all functions affecting public safety should be under his sole supervision.

There is a belief that existing schedules will not increase appreciably because the larger airplanes to be used will tend to reduce schedule frequencies, but increase in feeder lines, the rapid growth of business, the coming specialization in freight airplanes may result in much greater traffic density.

Another weak spot in airways control is the regulation of the itinerant pilot. The majority of private pilots fly safely and conservatively but there will always be some who will endanger lives by disregarding rules and regulations. Unfortunately there is little hope of curbing their activities because if they get away with it, no one will be the wiser (in thick weather), whereas if they should collide in the air with an airliner or some private pilot, it is then too late to do anything about it.

Unfortunately in thick weather, when radio is most necessary, static conditions are sometimes so bad that clear communication is often very difficult, and unfortunately it is usually at such times that the radio channels are most congested. Occasionally delayed schedules will increase the traffic density and thus accentuate this confusion. A modified code system and limiting the aid to only essential communications might help this condition.

To comply with the Bureau's Notice of Nov. 15, prohibiting intentional instrument flight except with two-way radio, each airplane should be equipped with at least a receiving set to let the pilot know ahead of time (by weather reports) whether he will be required to fly on instruments. Otherwise he may take-off with weather reports indicating little possibility of instrument flight, yet the weather may change and often he has no choice but to proceed. If he could be forewarned in flight by radio, this safety measure could be more readily followed. The development of a very inexpensive reliable two-way radio would assist the itinerant pilot greatly, for in the immediate future planes will fly along the airways in ever increasing numbers.

One suggestion comes out of England that may relieve the danger of collision in the air. It is proposed that each aircraft carry a small transmitter to emit a constant radiation of warning signals,—to surround itself with an "Aura," as it were. With proper receiving equipment each aircraft could pick up the signals from other machines in its neighborhood and be warned of the direction of approach.

Another suggestion would be the allocation of definite altitudes to itinerant pilots in thick weather and limiting the air transport terminals to airplanes equipped with two-way radios, other airports being provided for itinerant aircraft not so equipped.

In the meantime, until some better system is evolved the Airways Traffic Control Office system seems to be the best way to prevent collision and confusion in the air. But its proper operation depends entirely upon the complete cooperation of all the pilots who make use of the airways. It is up to everyone who flies to do his part.

Watch Your Step!

Your airport is a fertile breeding ground for damage suits

THE OWNER, operator or lessee of an airport, whether private or municipal, assumes a responsibility toward visitors who may come to his field, either to fly or to watch others fly. Furthermore, it is an established fact that anyone responsible for the existence or use of any premises, whether occupied by buildings or not, assumes a responsibility toward members of the public who lawfully enter or pass by the premises on public streets or highways. Even with the most careful supervision, a landing field with appurtenant buildings presents many possibilities for liability claims other than those arising out of flying operations.

Most airports provide a place where visitors may watch activities. Whether or not they pay for entering the field, they are guests, and the airport operator is obliged to exercise care in protecting their persons and property. The duty an owner owes to anyone whom he expressly invites upon his premises has been defined in law as follows:

> **It is his duty to use ordinary care and prudence to make and keep the premises safe for the visit, and he is liable to the visitor for any breach of this duty which results in the visitor's injury.**

This quotation applies to premises in general which may be inherently safe. It also applies to airports, premises which are potentially dangerous. The mandatory "duty to use ordinary care and prudence to make and keep the premises safe" necessarily implies greatly increased caution in the case of airports.

Any pilot making a landing at an established airport has a right to expect the field to be suitable for landing. Should an airport employee leave an obstacle on the field, or leave some soft spot on the field unmarked, or improperly marked, and should such negligence result in an accident, the owner or operator would be exposed to a suit for damages. Damages claimed might be for bodily injuries to the pilot and his passengers, or for damage to the aircraft itself.

It is also quite conceivable that an airport owner might be liable for damage to an aircraft and for personal injury to pilot and passengers due to engine failure caused by some defect in the gasoline purchased at the airport. In such a case the disabled airplane might be forced down into a crowd of spectators or parked automobiles, causing further liability claims.

Children are naturally attracted to airports by their enthusiasm and curiosity and are often unaware of surrounding dangers. Injuries sustained while they are meddling with parked aircraft, or struck by idling propellers or moving aircraft, or while snooping around improperly guarded hangars can result in serious liability for the airport.

Municipally owned and operated airports are *not* exempt from liability. The question of their liability has been considered by the courts. Decisions concur that in owning and operating an airport, the municipality acts not in a governmental capacity but in its corporate or proprietary capacity and is, therefore, liable in the same manner and to the same extent as an individual. In a recent Alabama case (City of Mobile vs. Lartifue, 127 Southern 257) the court stated:

> **As already indicated, we are of the opinion that appellent, City of Mobile, in acquiring and operating the airport in question, displayed a commendable degree of foresight, and spirit of progress; but in its operation it is engaged in a purely corporate capacity.**
>
> **In respect of its purely business relations (as here) as distinguished from those that are governmental, a municipal corporation is held to the same standard of just dealing that the law prescribes for private individuals or corporations. Then (now) the municipality acts for the private advantage of the inhabitants of the city, and to a certain exent for the city iself. 43 C.J. 183.**
>
> **If a function, undertaken by a municipal corporation, is commercial in its nature, the corporation is not exonerated from liability by the fact that its operations are not or cannot be profitable. 19 R.C.L. 1112.**
>
> **So we hold that the grounds of appellant, City of Mobile's dermurrer to the complaint, taking the point that the city was shown to be, at the time in question, engaged in the performance of a "governmenal act," etc., and hence not liable, were properly overruled.**

While airports lying on established airways may have no greater liability in law than the more inaccessible airport, nevertheless, there is a greater exposure to liability. It behooves the management of every airport to see to it, for his own protection as well as for the protection of the users of the field, that the airport is properly policed and maintained. It is of utmost importance in the event of suit to be able to establish the fact that there was no negligence on the part of the operator involved. So—Watch your step!

How Rhode Island State reconciled the specifications of both airport operator and pilot in a single installation.

For the Airport Lighting Problem:

A New Formula

By Major F. E. Hulse

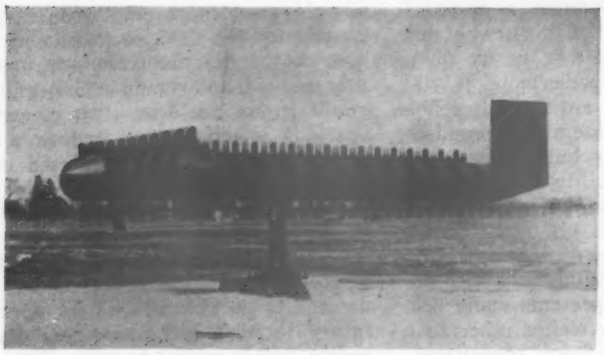
A. P. Taliaferro, Jr. & Co., Inc.

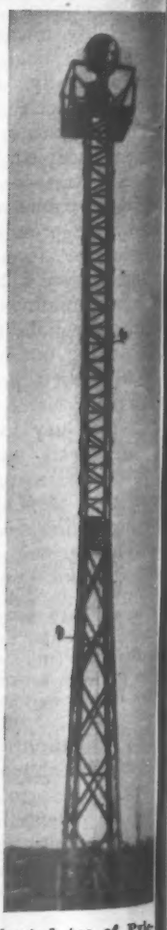
BRING UP the subject of lighting at any gathering of airport officials and you will get almost as many opinions as there are participants in the discussion. And if you are faced with an airport lighting problem the best procedure is to get as many sound opinions as possible, weigh them carefully in the light of your own experience and the requirements of the particular airport, then use your own judgment.

This is essentially the procedure followed in laying out the system used at the new Rhode Island State Airport at Warwick. The design was made after careful study of the requirements of a large number of operating companies expressed in replies to a widely circulated questionnaire. As a result the installation satisfies the requirements of a typical airport of medium size for day and night transport accommodation.

Modern in every respect, the Rhode Island State Airport had perfectly graded surfaces for all-way use, three 3,000x150 ft. concrete runways, a 1,400x150 ft. concrete apron, and a multiple drainage system. On the north side of the field is the administration building and light control is centralized in the port director's office. Pilots of radio equipped ships can ask for whatever illumination they want. Floodlights, flush lights, or a successive combination of both are available on request. An illuminated tee gives both direction and velocity of wind and a spherical beacon marks the field.

For general field lighting two groups





Top: Wind direction and velocity are indicated by this illuminated tee of Pyle-National design. Above: One of the two banks of Crouse-Hinds floodlights. Right: No goldfish bowl, but a Bartow Spherical Beacon projecting three beams.

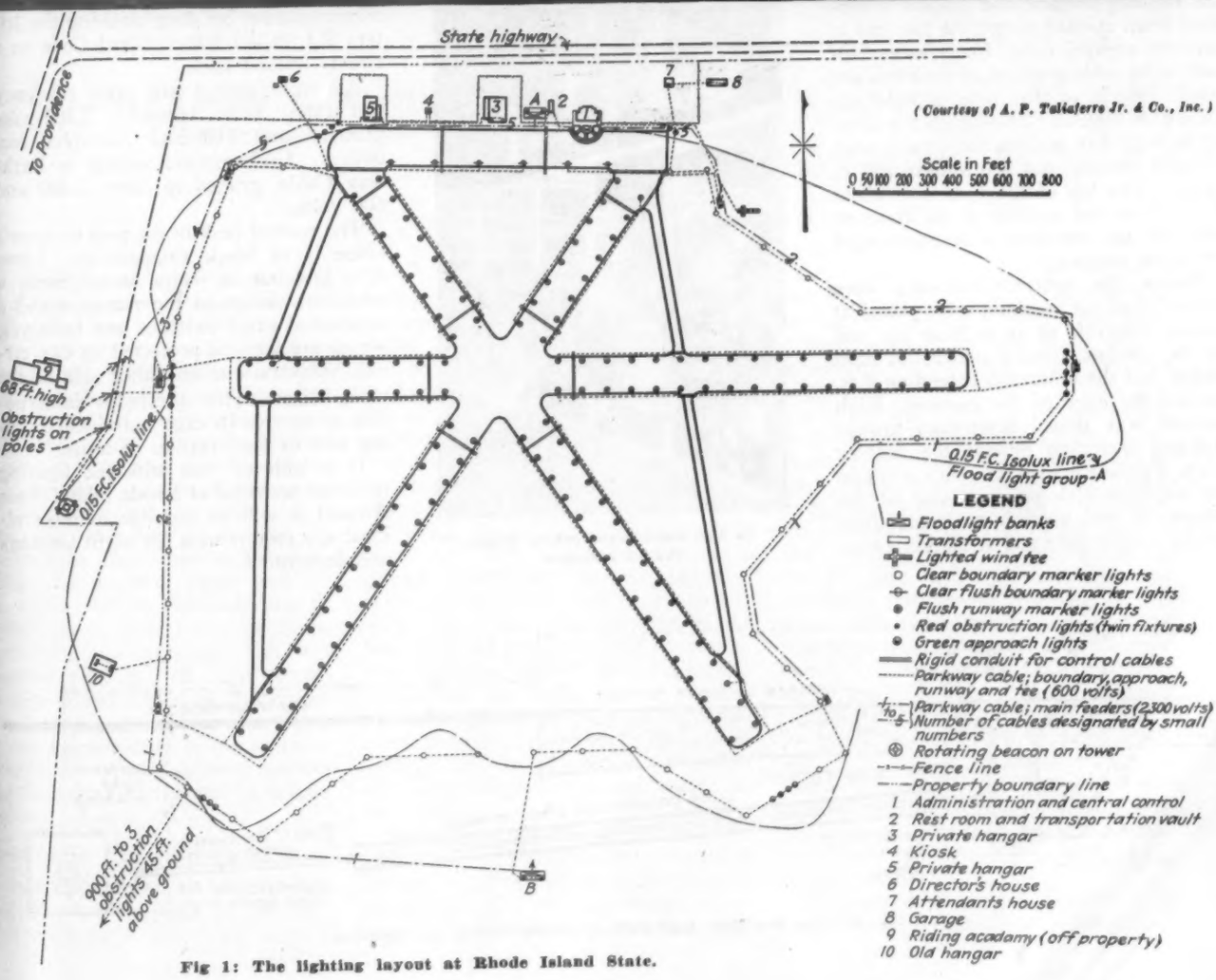

State highway
To Providence
(Courtesy of A. P. Taliaferro Jr. & Co., Inc.)
Scale in Feet
0 50 100 200 300 400 500 600 700 800
68 Ft. high
Obstruction lights on poles
0.15 F.C. Isolux line
0.15 F.C. Isolux line
Flood light group-A
900 Ft. to 3 obstruction lights 45 Ft. above ground
LEGEND
Floodlight banks
Transformers
Lighted wind tee
Clear boundary marker lights
Clear flush boundary marker lights
Flush runway marker lights
Red obstruction lights (twin fixtures)
Green approach lights
Rigid conduit for control cables
Parkway cable; boundary, approach, runway and tee (600 volts)
Parkway cable; main feeders (2300 volts)
Number of cables designated by small numbers
Rotating beacon on tower
Fence line
Property boundary line
1 Administration and central control
2 Rest room and transportation vault
3 Private hangar
4 Kiosk
5 Private hangar
6 Director's house
7 Attendants house
8 Garage
9 Riding academy (off property)
10 Old hangar

Fig 1: The lighting layout at Rhode Island State.

of floodlights are used; Group A just north of the apron and west of the administration building and Group B on the opposite side of the field. Each group consists of six 24-in. Crouse-Hinds floodlights of 3,000 watts using 32-volt lamps with prong bases.

The lights in Group A are set in a line 4 ft. on centers. The light farthest west has a spread angle of 80 deg. while the other five each have a spread of 40 deg. This arrangement produces the isolux curves shown on the plan in Fig. 1. The arrangement in Group B is slightly different, however, the lights being placed in the arc of a circle of 9 ft. radius. One 80 deg. spread light and five 40 deg. spread lights are used.

Group A is elevated to 13 ft. above the ground and Group B is about 15 ft. high, so that any shadows cast are at a minimum on any portion of the field or runways. Each group gives a minimum intensity of 0.15 foot-candles at the extreme limits of the boundary lights. Each light is equipped with a 3 kw. transformer for 2,300-volt primary and 32-volt secondary currents.

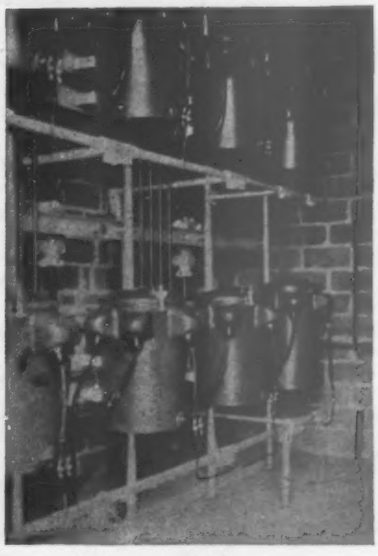
Flush-type markers

Flush type marker lights of the Crouse-Hinds type define the edges of each runway. They are set flush with the runway surface and project a vertical beam upward through a flat lens to produce parallel rays. Forty-watt, 110-volt bulbs with medium screw bases are used. Details of this type of light are shown in Fig. 2. The lights are lined up in rows 5 ft. in from the outside edge of each runway and are spaced 100 ft. apart. The top of the fixture is about $\frac{1}{8}$ in. above the surface of the concrete and will not interfere with plows used for snow removal.

Before the concrete runways were poured, lead-out conduits were placed at proper intervals so as to have one end of the conduit directly under the light socket and the other end extending 2 ft. beyond the edge of the runway. Each conduit was sloped downward toward the end extending outside the runway edge. By the use of a reference mark on the adjacent slab on each side of the runway it was possible to locate these conduits accurately and at the same time to fix the exact center of the light socket for location of the conical sheet iron form which provided the aperture in the slabs while the concrete was being poured. The forms were centered and held in place at the proper elevation by a frame supported on the adjacent slab and the outside rail-form of the slab being poured, then filled with gravel to keep their shape during the pouring process. As the outside of the forms were well greased it was a simple matter to remove them after the concrete had set, leaving clean conical holes in the slab centered directly over the end of the lead-out conduit. Into this aperture was placed the flush type lighting fixture, which was permanently held in place by filling the space around the fixture with cement grout. Details of this construction are shown in Fig. 2.

Wind tee

Wind direction during the day and both direction and velocity of the wind during the night are indicated by the 24x13 ft. tee. The velocity is shown by a wind pressure actuated electrical device that causes colored lights on top of the body to change according to the force of the wind. When the velocity is below 10 m.p.h. green lights show; for velocities 10 to 20 m.p.h. both green and amber lights are on; and for velocities above 20 m.p.h. only amber lights are visible. The tee is painted in 8-in. wide black and chrome yellow stripes. It is of Pyle-National manufacture, supported on a steel standard set in heavy concrete so that the whole is raised about 7-ft. above the field level, equally visible on the ground and from the air.



In the main transformer vault, the oil switches.

Boundary marker lights are disconnecting cone type (General Electric No. 4,342,861-Gl.) painted in accordance with United States Department of Commerce regulations. They are equipped with multiple sockets and 40-watt yellow lamps with screw bases and are operated on a 110/220-volt secondary transformed from a 2,300-volt primary. The boundary marker lights along the south edge of the concrete apron are of the flush type. Each runway is designated by 3, 4 or 5 green cone-type approach markers similar to the boundary markers. These lights are operated from a 110-volt circuit and use 60-watt screw base lamps.

A 36-in. rotating "Bartow Spherical Beacon" is located on a 65-ft. steel tower on the west side of the port. The beacon rotates at the rate of 6 r.p.m. The code flash light is located on the top of the administration building, flashing the letters R.I. in the International Code on a twenty second cycle.

All transformers are high efficiency wet type, 3-kw. capacity, 2,300-volts primary and 110 and 220-volts secondary. Underground wiring is Parkway Cable, graded to carry 2,300 and 600 volts.

The control desk in the port director's office is of black composition. Upon it is laid out in white Monel metal a miniature design of the runways and a number of small switches and bullseyes, which are fed and protected by two circuit breakers, one on either side of the main wires. This precludes interruption of service in each individual lighting unit or combination of units.

It is believed that with the lighting facilities provided at Rhode Island State Airport it will be possible to meet almost any requirement for night landings and departures.

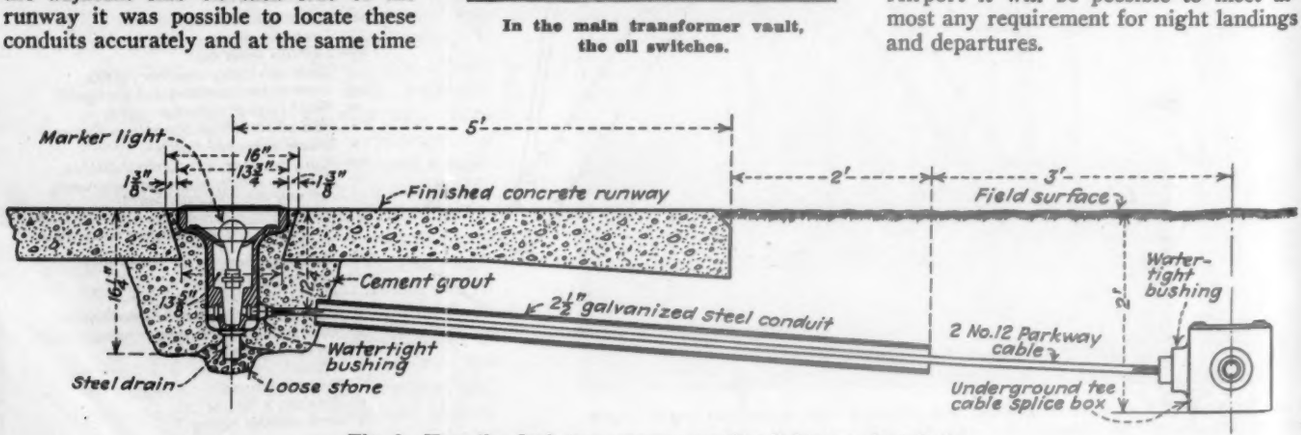


Fig. 2: How the flush type runway marker lights are installed.

Eight Regional Conferences Provide

A Melting Pot for New Airport Ideas

Taking a tip from Mohammed, Fowler W. Barker, well known trade association executive, reversed the usual procedure of holding a single national airport conference and took the conference to the operators. The tour wound up last winter, but the proceedings upon which the following article has been based have only recently been released.

By Leslie E. Neville
Managing Editor, AVIATION

WHEN the Aeronautical Chamber's National Airport Conference was taken on the road an opportunity was afforded to try a brand new experiment. Never before had a single set of agenda been laid before groups of experts in strategic sections of the country. Never before had there been a chance to make a serious study of the mass opinion of the active airport operators of the nation.

From the inaugural gathering in Washington to the climax at Birmingham, Ala., the meetings were well attended. Many of the delegates saw fit to follow along with the traveling troupe to more than one conference. It was the special privilege of your correspondent to attend almost all of the conferences and to participate in the preparation and condensation of the minutes. It is from these recently released minutes that the following high spots have been selected for presentation.

Congestion in three dimensions

The traffic policeman at Fifth Avenue and 42d Street, New York, has an easy job compared with that of the control tower operators at Cleveland Airport during the ten minutes when fourteen scheduled take-offs and landings are made. And yet Manager Jack Berry sees no need for traffic segregation until the congestion gets considerably worse. But all ports have not solved their traffic problems as effectively as Cleveland Municipal, where the field is large and tower personnel has been hand-picked and trained over a period of several years. Selection and training of personnel are both important but who is going to foot the bill? Is it the obligation of the nation, the city fathers or the airline? These questions came up at the New England conference but no conclusive answer was found. Detailed recommendations for traffic control practice and proceedure were contained in a subcommittee report presented at the Detroit meeting. (Details of the latest system of traffic control are discussed on page 22.)

Naturally every one agreed that the ideal system of traffic control at terminal airports would be two-way radio on every ship permitted to land at a transport airport. But champions of private flying, notably President George Orr of Roosevelt Field, pointed out vociferously that such a regulation at present would work a fatal hardship on light plane owners because of the cost and weight of radio equipment.

Possibly the solution to the congestion problem lies in segregation of activities at transport airports. If so, whose activities should be restricted? One ardent fixed base operator suggested eviction of the transport lines. Others felt that the line should be drawn between instruction and pleasure flying on one hand and scheduled and charter operation on the other. But by and large the opinion was that segregation was not yet necessary except at certain busy ports (Chicago is doing it already). A more reasonable solution, in force at many airports, is the restriction of miscellaneous activities when scheduled transport planes are in the neighborhood. But what of the future? If segregation is inevitable, why not get the alternate airports needed while there are federal funds with which to build them?

Discussion of future airports led naturally to the question of state and

local planning. Some states, including California, Oregon, Michigan and Florida, had developed well organized programs while others were notably lacking in their foresight. Most of the better plans were made with primary consideration for airport developments along the trunk line airways and secondary stress on possible feeder line developments.

A zoo for your airport

Swimming pools, golf courses, and a miniature zoo were among the extra-curricular attractions discussed under the subject of community recreational facilities at airports. In spite of the successful examples at Glendale (AVIATION, November 1933); Akron; and other ports (Roosevelt Field has just broken ground for an auto race track) large numbers of airport managers are unalterably opposed to any departure from aviation activities at flying fields. But, in general, the operators whose aviation activities are combined with recreational attractions are less concerned with budget worries and public acceptance of the airport as an established institution than the others. It was the sense of several conferences that dignified non-aeronautical activities would do much to sell aviation to the public providing they did not detract from the aviation business.

Surfacing problems

No standard formula could be developed for the technical problems of surfacing or drainage and each project must be regarded as a special case. Fundamental factors determining the surfacing most suitable for a given airport include type and volume of traffic, altitude and character of field, and funds available. It was generally conceded that concrete was desirable where its cost was not prohibitive but its major disadvantages lay in its destructive effects on airplane tires. Softer surfaces derived by asphaltic treatment of soil have attracted attention recently because of their mechanical resiliency and relatively low cost. A statement on the experience with bituminous types of surface at Clover Field, Santa Monica, Cal., Glenn L. Martin Airport, Middle River, Md., Burlington, Vt., and other places was furnished for the conference record by the American Bitumuls Company. This process is subject to a number of variations and requires preliminary chemical analysis of the soil for successful selection of the correct formula. Certain types of asphalt construction require fairly continuous use to keep the surface kneaded into position in hot weather and to prevent disintegration from brittleness in cold periods. Maintenance of seal is of tremendous importance as water seeping through may be highly destructive to the surface.

Although soil-stabilized runways were not discussed extensively at the conferences, their application has attracted much interest among road and airport builders seeking inexpensive methods of construction. The process of construction consists essentially in providing a deep subgrade of properly selected rock and a surface of ordinary soil mixed with chemical agents for moisture absorption. The moisture acts as an effective binder. In addition to its low cost this type of runway construction is particularly adapted to relief projects where there is an excess of labor over materials.

Chairman Steadham Acker of the National Airports Committee.

Fowler W. Barker, Secretary of the Committee.

WPA has built a substantial mileage of satisfactory soil-stabilized roads in upstate New York where the character of the soil is well adapted to this treatment. Besides proper soil character, inherently moist air is an essential condition for success in this type of construction. Like the bituminous type of runway, soil stabilized areas can be used very satisfactorily as subgrading for future concrete construction.

Exponents of turf fields appeared in various parts of the country and extensive studies of seeding and grass formulas have been made by Howard Shafer at Rochester, William Wormsted at Hartford, Major B. E. Fulton at Akron, and Major John K. Berry at Cleveland. (Swan Island is another good example of a turf field.) The ultimate solution to an airport surfacing problem often lies in a combination of types of treatment. A central concrete strip with asphaltic shoulders and turf between runways was one interesting combination discussed.

Runway drainage, Lights

More important than the selection and application of surfacing is the drainage of airport runways. Most of the damage done to runway surfaces is due to improper drainage. Landing loads are relatively unimportant. Discussion centered largely around the form of runways for proper drainage. In concrete construction the inverted crown type (pitch 1 in. in 50 ft.) found many exponents. A new development at Rhode Island State airport is a compromise, involving a normal crown in the center and inverted crowns on each side to direct water into the drainage system rather than retain it in the center of the runway. Close supervision is required in this type of construction as contractors may be inclined to skimp with disastrous results.

Operators from cold countries have made extensive use of a device known as Snow-Go which atomizes snow through a whirling system and deposits it in the form of mist at the side of the runway. Packing the snow with tractor drawn "plankers" was advocated by several upstate New York delegates.

Little agreement could be found on the important subject of airport lighting but most of the discussion boiled down to the question of floods vs. flush runway marker lights. Pilots in general object to floodlights because of glare and airport managers feel that the landing area should be illuminated before landings to reveal any possible obstructions. Willard Fletcher, chief of the Rhode Island State Airport Division, has combined both at his new airport and uses the floods to illuminate the area before landing and the flush lights to outline the runways. (Installation details are on page 26.) At Atlanta Airport, Manager Jack Gray has devised an ingenious floodlight from a discarded beacon.

Editorials

AVIATION • ESTABLISHED 1916
VOLUME 35, NUMBER 7

OPEN LETTER TO A SENATOR

Honorable Royal S. Copeland,
Washington, D. C.

Dear Doctor Copeland:

We were very much interested in your preliminary report on airline safety as it appeared in the Congressional Record of June 20. Frankly it is a much better job than we had expected. Obviously, you have made a great deal of effort to get at facts and to be fair in your deductions. Discussing some of the technical details of the Cutting accident, some of your experts have gotten in a bit over their heads, but, by and large, they have turned out a reasonably fair reconstruction of what might have occurred.

We are much less concerned, however, with the details of the accident than with your recommendations which deal with the reorganization of the Bureau of Air Commerce. It is gratifying to note that you have reached some of the same conclusions that we expressed in our editorial in our May issue.

You have convinced yourself that the real mistake was made in the way the present bureau was appointed and organized, that the men in charge have worked under a handicap from the start.

We cannot help but view with some alarm the implications of the "whitewashing" of some and the damning of other of the Bureau personnel. As we have stated before, we have nothing personally against any individual in the Bureau, but we feel that with conditions as they are it would be futile to attempt anything short of a complete renovation in the executive departments. The feuds which have developed during the past three years are now so deep-seated that a victory for any one faction would scarcely cure the trouble. It might conceivably make conditions much worse.

We are convinced that the time is long since passed for halfway measures. The only possible way to restore industry confidence in the Bureau of Air Commerce is to free it entirely from its political shackles. Ideal, perhaps, but surely not impossible.

We are looking forward eagerly to the balance of your report which deals with airline safety. We regret, however, that we must wait until sometime "early next year." A lot of people, including ourselves, are going to ride on the airlines a good deal between now and the spring of 1937 and it seems too bad that we must be deprived of the benefits of your committee's findings in the interim. Or, could it be, by any chance, that the airlines are not as unsafe as the press reports on your committee's activities have led the public to believe?

Respectfully yours,

S. Paul Johnston

Editor

DISSENSION IN CAMP

WE HAVE had great hopes that the formation of the new Air Transport Association of America marked the beginning of some real cooperative effort on the part of the airlines to solve some of their common operating problems. Lately, however, we have been not a little disturbed by arguments cropping up here and there over the country concerning overlapping spheres of influence, and the problem of route extensions. We are not surprised that differences of opinion should arise over these questions, but we cannot help but deplore the attitude taken by some of the airline officials in arguing their cases before the Interstate Commerce Commission. Charges and counter-charges involving bad faith have been made. Claims have been met by counter-claims in unrelated cases, obviously set up for purposes of "horse-trading." Maneuvers of this sort always tend to confuse rather than to clarify issues. This difficulty might be avoided by settling inter-line disputes, whenever possible, within the confines of the A.T.A. A great deal has been accomplished in a short time by cooperative effort in the technical departments, but we hope that the good work already started will not become completely bogged down in a welter of internecine bickering.

SOARING SEASON

LAST YEAR we expressed the sincere hope that soaring activities in this country would be carried on to bigger and better things in spite of the loss, through untimely death, of Warren Eaton. Judging from the turnout at Elmira this year, our hopes seem to have made a good start toward fulfillment. Although it is too early to cast up the final score in terms of records broken and hours flown, the indications are that this year's performance will far and away exceed last year's. Lange, Southee, Barnaby, and other officials of the soaring society have done a good job in organizing and carrying through this summer's meet. More power to them!

Flying Equipment

What's new in aircraft, engines and major accessories

Aeroneer 1-B

New two-place all-metal monoplane makes its appearance on the Pacific Coast

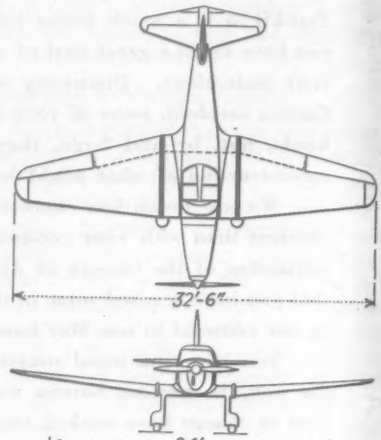
PERSISTENT rumors of a new airplane for the private flyer have been drifting East from the Pacific Coast for some time, but so far details have been lacking. Now, however, here they are. We present the Aeroneer, soon to be in full production by the Aero Engineering Corporation of Los Angeles and Long Beach. The new ship is designed and constructed along transport lines and brings to the private pilot many of the features that have come to be accepted as standard in large airliners and modern military planes. Designed for the Menasco C-4 engine (see page 35) the Aeroneer offers an interesting addition to the moderate priced two-place airplane field.

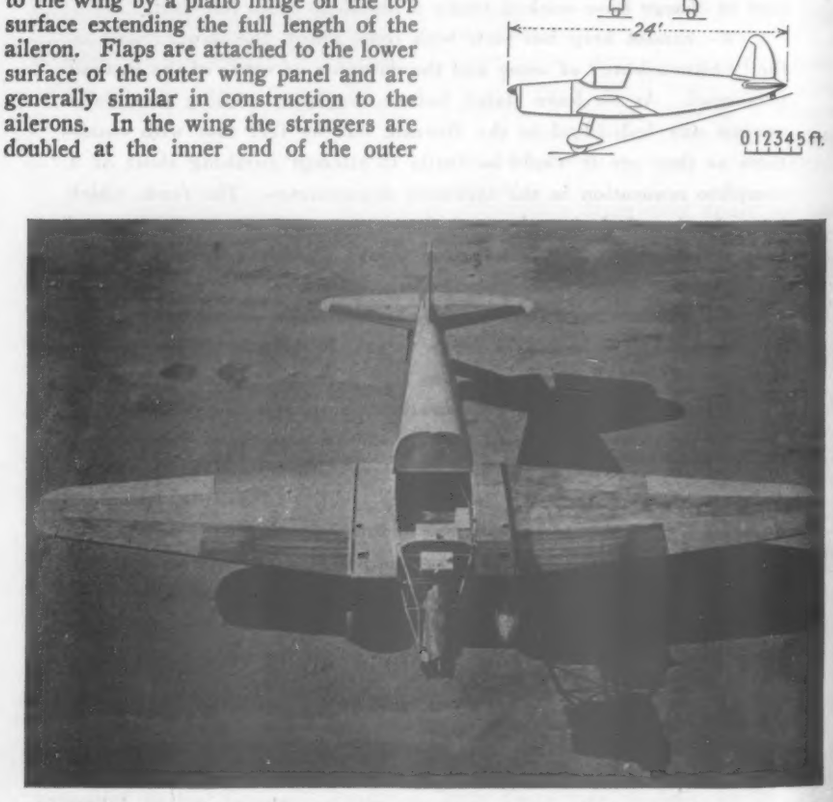
The fuselage structure follows modern monocoque construction practice. Heavy longitudinal members carry the stresses from the engine mounting at the firewall to a point behind the cabin section where they fade out and are replaced by stiffeners. Engine mount fittings are riveted and bolted to the front end of the heavy members and the welded steel tube engine mount is attached to the fittings by tension bolts. Vertical stiffeners are used between the two heavy members on each side of the fuselage and are designed in such a way that the sides of the fuselage and the cabin section are Wagner beams. Since the cabin section is not totally closed, four chrome molybdenum steel tubes are built into the structure to take the torsion from the rear of the fuselage down to the wing. They also increase the rigidity of the structure around the cabin and would carry any impact loads in the event of a noseover. The skin is 24ST Alclad and the firewall is stainless steel .016 in. in thickness.

In order to simplify maintenance, the wing is built in five sections,—the center section, two outboard wing panels, and two tips, each of which is independently removable. The operation of removing the outer wing panels from the center section requires less than one hour. Tips are fastened to outer wing panels by means of bolts and elastic stop nuts and the outer wing panels are attached to the center section by means of attaching angles and bolts. The wing tip is built up of skin and span-wise formers which fasten to the rib located at the tip of the outer wing panel. The outer wing panel is of stiffened skin construction using a combination stiffener and beam type of structure. The beam is designed as a shear field beam with vertical stiffeners and supporting members according to Wagner's analysis of thin sheet beams. It is located at the 30 per cent point of the chord and its centerline is straight from tip to tip and perpendicular to the plane of symmetry of the airplane. This arrangement obviates any eccentric loading of the spar. A shear-carrying member running along the wing at 65 per cent of the chord closes the torsion box formed by the covering.

Ailerons are built of 24ST Alclad and covered with fabric. They are attached to the wing by a piano hinge on the top surface extending the full length of the aileron. Flaps are attached to the lower surface of the outer wing panel and are generally similar in construction to the ailerons. In the wing the stringers are doubled at the inner end of the outer wing panel to eliminate concentrated loads on the attaching flanges. Spar caps on both top and bottom of the wing at the joint between the outer wing panel and the center section are riveted into double plates which also are riveted into the attaching flanges.

The center section is structurally similar to the outer wing panel. Landing gear mounting is a 24ST built-up socket





The Aeroneer in the course of construction. One wheel fairing has been removed to show landing gear.

Looking toward the tail in the fuselage structure.

The Aeroneer tail group (unfinished).

Detail of landing gear design.

riveted to the top surface of the center section and also to chord-wise bulkheads which are fastened to the main spar by tension bolts besides being riveted to the skin along their entire periphery. The span-wise stiffeners forward of the main spar on the top of the wing fade out between the joint of the center section and the outer wing panel as they approach the fuselage. Extra members fade in from this joint behind the front spar to pick up the loads. These extra members are under part of the center section which is used as a seat, adding considerably to the rigidity of the structure. The center section is fastened to the fuselage by means of a heavy built-up 24ST angle riveted to the top surface of the center section and to the lower main member of the fuselage. On the center section the flap is carried on piano hinges and is actuated just inboard of the joint by means of an irreversible screw mechanism driven by torque tubes passing through a control tunnel in the center section. Control wires and gas lines also pass through the tunnel. Gasoline tanks are mounted in the center section aft of the main spar and forward of the shear-carrying rear spar.

Fixed horizontal and vertical tail surfaces are built up of 24ST Alclad and covered with the same material. Elevator and rudder have metal structure and fabric covering. The front spar of the stabilizer is designed to take the shear and localized bending loads. The rear spar is designed to carry the total bending moment across the stabilizer structure. The front spar of the vertical fin is designed in the same manner as that of the stabilizer and the rear spar is designed to take the total bending load and is bolted into a fuselage bulkhead. Elevators and rudder are dynamically balanced. Control is by torque tubes, horns and cables and ball bearings are used generously in the system.

The front face of the fin rear spar is 14 in. ahead of that of the stabilizer to provide sufficient room for the horns and actuating mechanism and to improve control in spins. This feature has been tried successfully in European and British designs.

One aileron and the rudder are fitted with adjustable trimming tabs. Elevator tabs are controlled by an irreversible lead screw through miter gear boxes and a torque tube leading to a control crank in the cabin. Dual control is provided and the aileron linkage is so designed that a failure in one would not affect the other unit.

The tail cone is of aluminum fastened with bolts and Elastic Stop Nuts to the rear of the fuselage structure. It is fitted with a socket for a Grimes tail light. Navigation lights of the same type can be installed just outside of the place at which the wing tips bolt to the outer wing panels.

Besides the main wing tanks in the center section there is an auxiliary tank behind the firewall which feeds to the carburetor by gravity. The emergency tank may be filled from the main tanks by a wobble pump, and carries sufficient fuel for ½ hour of flight. An Evans fuel pump and a wobble pump are used in the main tank system and a standard oil pump, furnished with the engine, draws oil from an aluminum tank on the firewall.

Each landing gear member consists essentially of a single steel tube incorporating an oleo-type shock absorber. This main member takes compression, bending and torsion loads, the latter being transmitted from the wheel by a scissor-type yoke. A tail wheel of the 360 deg. swivel type pivots in a steel socket attached to the fuselage by two steel legs which resist side load. Vertical motion is restrained by an oleo shock strut.

Three parts constitute the cabin enclosure—a fixed Plastacele windshield and two sliding hatches of the same material. No structural loads may be carried through the windshield supports. The hatches run on fairly loose rollers to prevent binding and may be locked in position by a friction clamp.

Specifications of the Aeroneer 1-B are: span, 32 ft. 6 in.; length, 24 ft.; height, 7 ft. 8 in.; wing area, 168 sq.ft.; maximum chord, 84 in.; weight empty, 1,066 lb.; gross weight, 1,800 lb. Full load performance: high speed, 147 m.p.h. (sea level); cruising speed (75 per cent rated power), 138 m.p.h. at 8,000 ft.; landing speed, (flaps down), 46 m.p.h. (flaps up) 54 m.p.h.; rate of climb at sea level, 750 ft. per minute; service ceiling, 15,600 ft.; cruising range, 750 miles.

This performance is based on the Menasco C-4 rated 125 hp. at 2,175 r.p.m. Other engines including the Menasco B-4, (95 hp.), C-4S, (150 hp.), and B-6, (160 hp.), as well as radial and in-line engines of similar power may be installed. Float equipment also is available.

Directors of the Aero Engineering Corporation are: Dr. Arthur L. Klein, W. C. Rockefeller, and Malte Swenson. Other members of the construction staff are Edward G. Ward, Carlow Wood, and Milford Childers.

Brown Model B-3

Commercial adaptation of famous racers now available

PRIVATE PILOTS who have looked with envious eyes at the special racing ships built by Lawrence W. Brown of Los Angeles, are now offered a commercial adaptation of the famous speed planes. The new Brown B-3 is a custom built sport plane whose performance approaches that of the Brown racers, but it is designed for the more modest abilities of the private pilot who flies chiefly

Q. E. D.

CURRENT performance of the China Clipper and her sister ships demonstrates beyond question the capacity of planes of this type for trans-Atlantic service.

Carrying heavy pay loads, these Martin-built Clippers take in their stride the 2410 mile hop from San Francisco to Honolulu—first leg of their 8000 mile route across the Pacific. This San Francisco-Honolulu hop is 354 miles longer than the longest hop on the now proposed U. S. to Europe routes.

THE GLENN L. MARTIN COMPANY
BALTIMORE, MARYLAND

Builders of dependable *aircraft since 1909*

A racer goes commercial,—the Brown B-3.

for fun. Like the racing planes, it is outstanding for its appearance and finish.

The first B-3 has been built for Dr. Ross Sutherland of Los Angeles who plans to use it in long distance personal flying. Although this model is a single-place ship, it has ample carrying capacity for two people and may be converted readily into a tandem two-place cabin plane. The B-3 design is such that the ship might be converted for military use and negotiations now under way with foreign governments may lead to a special military adaptation.

The B-3 design is generally similar to that of the "Miss Los Angeles" racer. It is a wire-braced low wing monoplane with rigid landing gear and highly streamlined fuselage. The fuselage is of welded steel tubing and the wings are built of wood with wire bracing. Tail surface structures are of metal with wire bracing. The entire structure is fabric covered except the engine compartment and the quarter decking to the pilot's cockpit, which are cowled with aluminum. A full N.A.C.A. slot-type cowling is used around the engine and is quickly removable for inspection. To improve the aerodynamic characteristics, a "bullet-nose" spinner has been designed to enclose the entire propeller hub and provide the necessary streamlining for the entering section. The pilot's compartment is covered with a sliding hatch that may be opened or closed during flight.

The chief distinction between the B-3 and the Brown racers is the introduction of the full Handley-Page slot system, which consists of automatic leading edge slots, manually operated, slotted flaps and slotted ailerons. All this has been incorporated in an unusually thin wing section. Not only have the slot and flap operating mechanisms been designed into the wing, but wire brace fittings and retractable landing lights are also built in without protruberances. Through the use of the Handley-Page system, a speed range of approximately 40 to 205 m.p.h. has been obtained. The full trailing edge flaps have been found to provide some improvement in take-off.

The engine is the latest product of the Menasco plant,—the Super-Buccaneer. This engine is rated 250 hp. at 6,000 ft. altitude and 290 hp. for take-off at sea level. It has been designed for transport and racing plane use and has been announced as optional equipment on the new Lockheed Model 12 feeder line plane. Among its special features is a fully enclosed valve gear with automatic lubrication of push rods and rocker arms and automatic scavenging of rocker boxes.

The instrument installation specified by Dr. Sutherland includes blind flying equipment, two-way radio, and engine temperature thermocouple. Although an adjustable Hamilton-Standard propeller has been used in flight tests, it is believed that a full controllable propeller will be installed in the near future.

Specifications of the Brown B-3 are as follows: span, 32 ft.; length, 26 ft.; height, 8 ft.; weight empty, 1,850 lb.; gross weight, 2,650 lb.; wing area, 150 sq.ft.

Performance is as follows: maximum speed, 205 m.p.h.; cruising speed, 190 m.p.h.; landing speed (with flaps), 40 m.p.h.; (without flaps), 60 m.p.h.; service ceiling, 18,000 ft.; climb per minute, 1,200 ft.; cruising range (normal), 600 miles.

The flaps and ailerons.

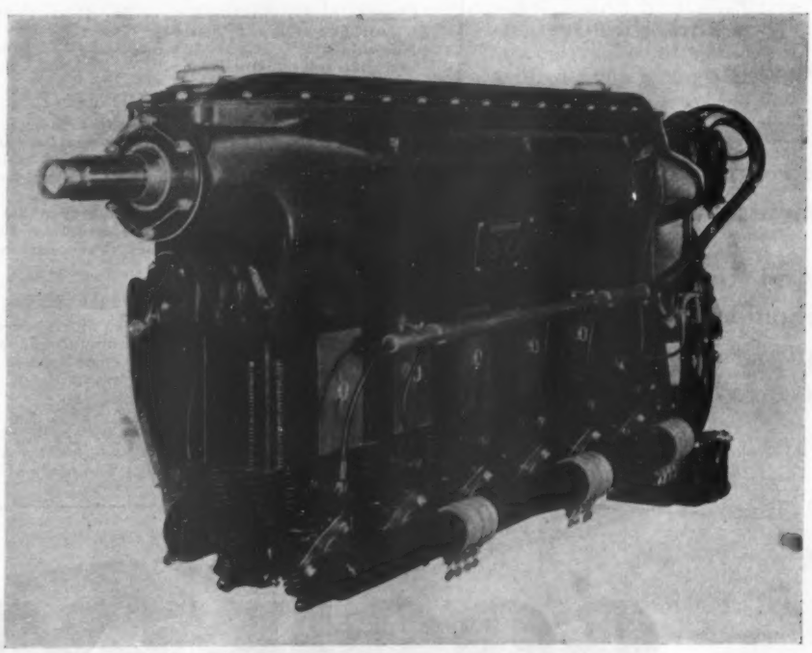
The leading edge slot.

Menasco Engines

Pirate and Buccaneer to be produced commercially

Long famous as record robbers, two engines known appropriately as "Pirate" and "Buccaneer" by Menasco, are to be produced in commercial quantities in the near future. Ever since the first "Pirate" (A-4) received its A.T.C. six years ago Menasco engines have made their mark in contests all over the world. The list is too long to repeat here.

Development and flight testing have



The Buccaneer Model B6S.

"The GREATEST NAME IN RUBBER" IS A GREAT NAME IN AVIATION TOO

MOST people, when they hear the name "Goodyear," think first of tires, tubes—and other rubber products.

But, in the airplane industry, a broader meaning attaches to this name. Here, Goodyear stands also for pioneering in the development of brakes, controls and wheel equipment for all types and sizes of airplanes—equipment which has contributed its share to the advancement of flying and the design of ships.

Goodyear literally grew up with the airplane industry.

And this shoulder-to-shoulder association has provided both the experience and inspiration for the long list of Goodyear "firsts"—among them, the Airwheel, first and only super-soft tire—the first hydraulic brake design developed exclusively for airplanes, rather than simply borrowed from the automobile; the first *pneumatic* airplane brake in America; and a dependable line of mechanical and hydraulic controls.

If you have a tough problem, involving brakes, controls or tires, Goodyear would like to tackle it. Just write Aeronautics Department, Goodyear, Akron, Ohio—or Los Angeles, California.

UNDER THIS FLAG

OF LEADERSHIP

•

HIGH PRESSURE TYPE

Clincher cords · Straight Side cords · Heavy Duty cords · Drop Center type · Flat Base type · Smooth tread · Non-skid tread · 16 sizes 10 x 3 up to 54 x 12 with tubes—regular and puncture seal

AIRWHEEL* EQUIPMENT

14 sizes 12 x 5-3 up to 45 x 20-10 with tubes · Re-liners to increase puncture resistance · Tailwheel hubs and self-contained bearing adjustment sleeves · No brake type wheels · Wheels with mechanical band type brakes · Wheels with Goodyear hydraulic disc type brakes · Wheels with Goodyear pneumatic disc type brakes · Controls—including master cylinders, hydraulic hose and special fittings for hydraulic lines · Pneumatic metering valves and air compressors

INTERMEDIATE OR LOW PRESSURE TYPE

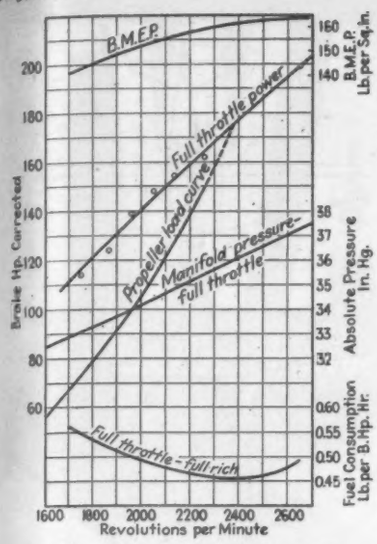
8 sizes 18 x 8.00-5 up to 55 x 19.00-23 with tubes—regular and puncture seal. Wheels with hydraulic disc type and pneumatic disc type brakes · Same complete line of controls as for Airwheels

STREAMLINE TYPE

For landing wheels—7 sizes · For tailwheels—6 sizes · Regular and puncture seal tubes · Cantilever-type tailwheels · Fork-type tailwheels · Axles and spacers

*If it isn't a Goodyear, it isn't an Airwheel! AIRWHEEL *is Goodyear's trade-mark, registered in the U. S. A. and throughout the world, and is used to denote that Goodyear is the exclusive maker of* AIRWHEEL *Tires*

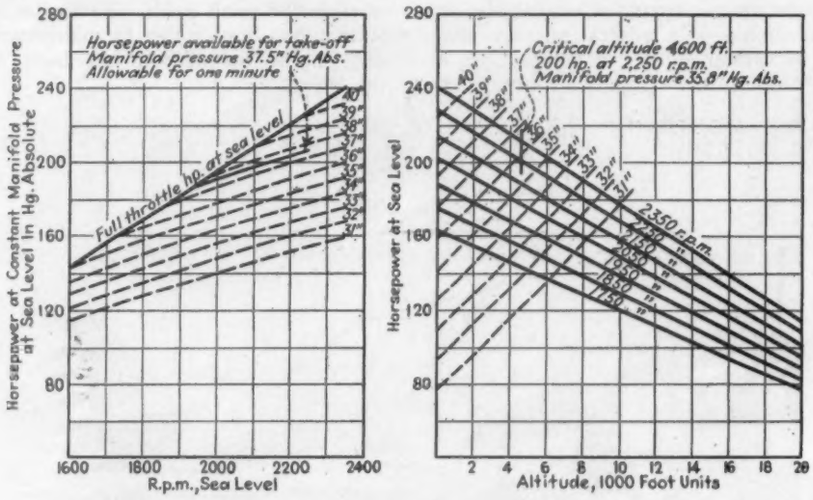
THE GREATEST NAME IN RUBBER



Performance curves for the C4S.

SPECIFICATIONS OF THE NEW MENASCO PIRATE AND BUCCANEER

Type	Pirate Model C4S, Four-Cylinder, Air Cooled, In-Line Inverted	Buccaneer Model B6S, Six-Cylinder, Air Cooled, In-Line, Inverted
A.T.C.	No. 134	No. 139
Bore	4½ in.	4½ in.
Stroke	5½ in.	5½ in.
Displacement	363 cu.in.	489 cu.in.
Compression Ratio	5.5 to 1	5.5 to 1
Supercharger Ratio	9.6 to 1	8.75 to 1
Horsepower (Department of Commerce rating)	150 at 3,000 ft. at 2,260 r.p.m.	200 at 4,500 ft. at 2,250 r.p.m.
Fuel Consumption	0.56 lb./hp.-Hr.	0.56 lb./hp.-Hr.
Oil Consumption	0.010 lb./hp.-Hr.	0.018 lb./hp.-Hr.
Dry Weight (without air scoop, fuel pump or propeller hub)	305 lb.	415 lb.
Weight of engine crated for shipment	460 lb.	683 lb.


Horsepower available for take-off
Manifold pressure 37.5" Hg. Abs.
Allowable for one minute
Full throttle hp. at sea level
Horsepower at Constant Manifold Pressure at Sea Level In Hg. Absolute
R.p.m., Sea Level
Critical altitude 4600 ft.
200 hp. at 2,250 r.p.m.
Manifold pressure 35.8" Hg. Abs.
2,350 r.p.m.
Horsepower at Sea Level
Altitude, 1000 Foot Units

Altitude performance of B6S model (supercharger ratio 8.75-1).

continued during the six-year period and six additional approved type certificates have been granted on models subsequent to the A-4 Pirate. The production models are the familiar C4S (A.T.C. 134) and B6S (A.T.C. 139). These engines are the lowest horsepower supercharged engines available in this country.

The superchargers are of Menasco design and manufacture and both engines embody a special cushion in the supercharger gear train to permit direct drive without a slip clutch. An exposed supercharger scroll and long intake manifold together provide an intercooler effect which reduces the temperature of the compressed charge and permits the use of high manifold pressures without excessive heating.

Crankcase construction is generally similar in both engines. The four-cylinder case is split on the crankshaft centerline and major stresses are carried by the lower half while the upper half acts as a cover. In the six-cylinder model the case is of the one-piece type, finned inside and out for strength and oil cooling, and having a cast Dowmetal cover plate. The mounting ledge in the six-cylinder model is cast integral with the case, while the four-cylinder design employs four separable mounting lugs of cast aluminum. Both crankshafts are Wyman Gordon forged chrome nickle steel (S.A.E. 3240) of one-piece construction. The four-cylinder engine has five main bearings while the six-cylinder model has seven. Both are provided with ball thrust bearings. All main and connecting rod bearings are of babbit metal.

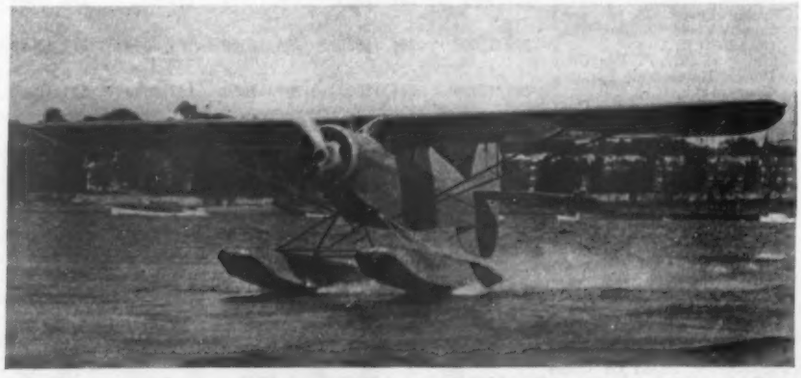
Pistons are of full skirt waffle head type with generous underhead cross-ribbing to give added strength and heat dissipation. Piston pins float in both the connecting rod and piston, and are located by end buttons. Nickel iron cylinders are standard on both engines although steel cylinders are optional for lighter weight. Separable heads are held to the cylinder and through to the crankcase by long nickel steel studs which provide easy servicing. Any cylinder head may be detached by removing four nuts and disconnecting the intake manifold. The heads are of Menasco cast aluminum alloy with one intake and one exhaust valve per head, spread laterally to provide ample cooling area over the head itself, and with generous finning for efficient cooling. The crankshaft itself has a splined propeller hub end No. 10 S.A.E. type. Standard S.A.E. mounting flanges are incorporated in the accessory case for mounting both generator and starter. Magneto ignition is standard with battery ignition optional. All aluminum castings throughout the engine are of Menasco foundry production, and a wealth of foundry research has gone into the perfection of improved alloys and casting methods.

Rearwin Seaplane

Sportster model now available with floats

ALL REARWIN Sportsters manufactured in the future will be equipped with fittings for seaplane float attachment. The ship was licensed as a seaplane recently with Edo 1525 floats.

The seaplane Sportster is licensed for two persons, 24 gal. of gasoline and a 65 lb. allowance for baggage and equipment. Licensed gross weight is 1,615 lb.

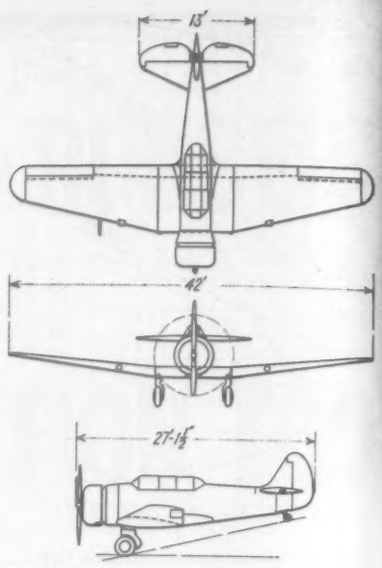


Licensed recently as a seaplane the Rearwin Sportster (Le Blond, 85 hp. engine) showed no loss in high speed performance.

North American NA-16

First ship from coast factory is a general purpose plane suited to a number of military missions

THE FIRST product to come out of the Pacific Coast factory of North American Aviation, Inc., is the NA-16, a modern military ship designed to Air Corps specifications and available in five variations—as a general purpose plane, a two-seater fighter, a bomber, an advanced trainer, or a single-seat fighter. The NA-16 is low-wing monoplane of all metal construction designed for high performance with landing characteristics suitable for small fields. Particular attention has been given to maintenance and engine installation has been developed so that the entire power plant can be removed and replaced by three men in 40 minutes.



The General Aviation BT9, Army Air Corps version of the NA-16 series.

Designed in a self-contained unit to take almost any radial engine from the 300 hp. Kinner through the Wright Whirlwinds and the Pratt & Whitney Wasps, the power plant installation represents considerable ingenuity. Socket type fittings secured by tension bolts connect the welded chrome molybdenum steel tube engine mounts to the fuselage structure. Engine mount lugs contain elongated rubber bushings to absorb direct engine and propeller vibration. The oil system is removable as a unit with the engine mount and all connections are of the solid metallic type. Oil coolers are provided when necessary. Cannon plugs provide contact for electrical connections between power plant and fuselage and can be made or broken in three minutes. Engine control rods are designed for low maintenance and easy removability. Cowling has been designed for the accessibility of all power plant parts and all cowl panels are interchangeable.

Aluminum alloy fuel lines are equipped with compression type fittings with flexible metal connections to facilitate removal. Fuel tanks are mounted in the center section wing stubs on either side of the fuselage.

The wing is constructed in five sections,—two outer panels, two tip sections and the center section. Right and left panels are interchangeable. Most likely to be damaged are the tip sections which are made extremely simple and easy to replace. Rugged aluminum alloy construction of the stressed skin type is used and the outer wing panels are arranged so that they can be made watertight to provide emergency flotation. NACA 2215 to 2209 airfoil sections have been combined in the development of the wing. Generous sweepback and dihedral have been employed. Ailerons

SPECIFICATIONS AND PERFORMANCE

Type	NA-16-1 General Purpose Two-Place	NA-16-2 Fighter Two-Place	NA-16-3 Bomber Two-Place	NA-16-4 Advanced Trainer Two-Place	NA-16-5 Fighter Single Place
Engine	P & W Wasp S3H1	P & W Wasp S6H1	P & W Wasp S6H1	Wright R-975-E3	P & W Wasp S6H1
Power/Altitude	550/5000	500/11000	500/11000	440/0	500/11000
Propeller	Two-Position Controllable	Two-Position Controllable	Two-Position Controllable	Fixed Pitch	Two-Position Controllable
Overall Span	42'-0"	42'-0"	46'-0"	42'-0"	36'-0"
Overall Length	28'-0"	28'-0"	27'-4"	27'-3"	27'-4"
Overall Height	8'-8"	8'-8"	8'-8"	8'-8"	8'-8"
Wing Area (sq.ft.)	248	248	262	248	225
Gross Weight, Full Load (lb.)	4,500	4,500	5,400*	3,860	4,350
Normal Useful Load (lb.)	1,454	1,435	2,282*	1,035	1,390†
Weight Empty (lb.)	3,046	3,065	3,118	2,825	2,960
Fuel, 104 Gal. (lb.)	624	624	624	624	624
Oil, 9.5 Gal. (lb.)	71	71	71	71	71
Miscellaneous equipment (lb.)	189	170	227	.....	95
Ordnance (lb.)	230	230	1,020	.....	430†
Crew (lb.)	340	340	340	340	170
High Speed, Fixed Landing Gear (m.p.h./ft.)	206/5000	212/11000	208/11000	184/S.L.	222/11000
High Speed, Retractable Landing Gear (m.p.h./ft.)	214/5000	220/11000	216/11000	191/S.L.	230/11000
Cruising Speed, 75 per cent Power, Fixed Landing Gear (m.p.h./ft.)	200/12000	206/18000	201/18000	175/8000	215/18000
Cruising Speed, 75 Per Cent Power, Retractable Landing Gear (m.p.h./ft.)	208/12000	214/18000	209/18000	182/8000	223/18000
Cruising Speed, 62.5 Per Cent Power, Fixed Landing Gear (m.p.h./ft.)	194/16000	196/22000	189/22000	169/13000	203/22000
Cruising Speed, 62.5 Per Cent Power, Retractable Landing Gear (m.p.h./ft.)	201/16000	204/22000	196/22000	176/13000	211/22000
Maximum Rate of Climb (ft./min.)	1,800	1,670	1,570	1,350	1,780
Absolute Ceiling (ft.)	27,300	30,200	29,200	26,400	29,400
Service Ceiling (ft.)	26,000	29,000	28,000	24,000	28,400
Landing Speed (m.p.h.)	65	65	65	56	67
Climb to 10,000 ft. (min.)	6.4	7.5	7.6	10.0	7.0
Take-off Run, Sea Level (ft.)	435	400	420	560	480
Cruising Range, 62.5 Per Cent Power (miles)	665	765	736	810	790
Cruising Range, Economical Speed (miles)	820	940	900	920	960
Performance Based on Gross Weight (lb.)	4,500	4,500	4,680	3,860	4,350

*Maximum Bomb Load.
†Includes 270 Lb. Bomb Load

"Fastest-Shortest-Coast to Coast"

Powered Exclusively by

WRIGHT CYCLONES

Wright Cyclones power all of the de luxe Douglas Skyliners operated by Transcontinental & Western Air—the shortest, fastest route from New York to California.

The famous TWA "Sky Chief' leaves New York at 5 P.M. and arrives in Los Angeles at 8 A.M. the next morning. This flight is one of six fast transcontinental schedules operated daily, in both directions by "The Lindbergh Line."

TWA has long operated a non-stop service, in both directions, between New York and Chicago. Morning, noon, afternoon and night TWA offers convenient schedules between America's largest cities. On June 13, 1936, the "Sky Chief" made the New York-Chicago run, with a capacity load, in the record-breaking time of 3 hours and 48 minutes—57 minutes ahead of schedule!

The Chicago - New York commercial transport record, also established by a TWA Cyclone-powered Douglas Skyliner, was made last winter in 2 hours and 54 minutes—at an average speed of 252 miles per hour.

The Wright Cyclone is the most powerful single-row, radial, air-cooled engine in service operation. Cyclones are used exclusively on TWA and other leading airlines of the United States—and they power the fastest transports on leading airlines throughout the world. "Powered By Wright" is your assurance of swift, dependable "Travel By Air."

TWA Schedules!
Non-Stop Flights
York to Chicago
Overnight
York to California

WRIGHT

AERONAUTICAL CORPORATION

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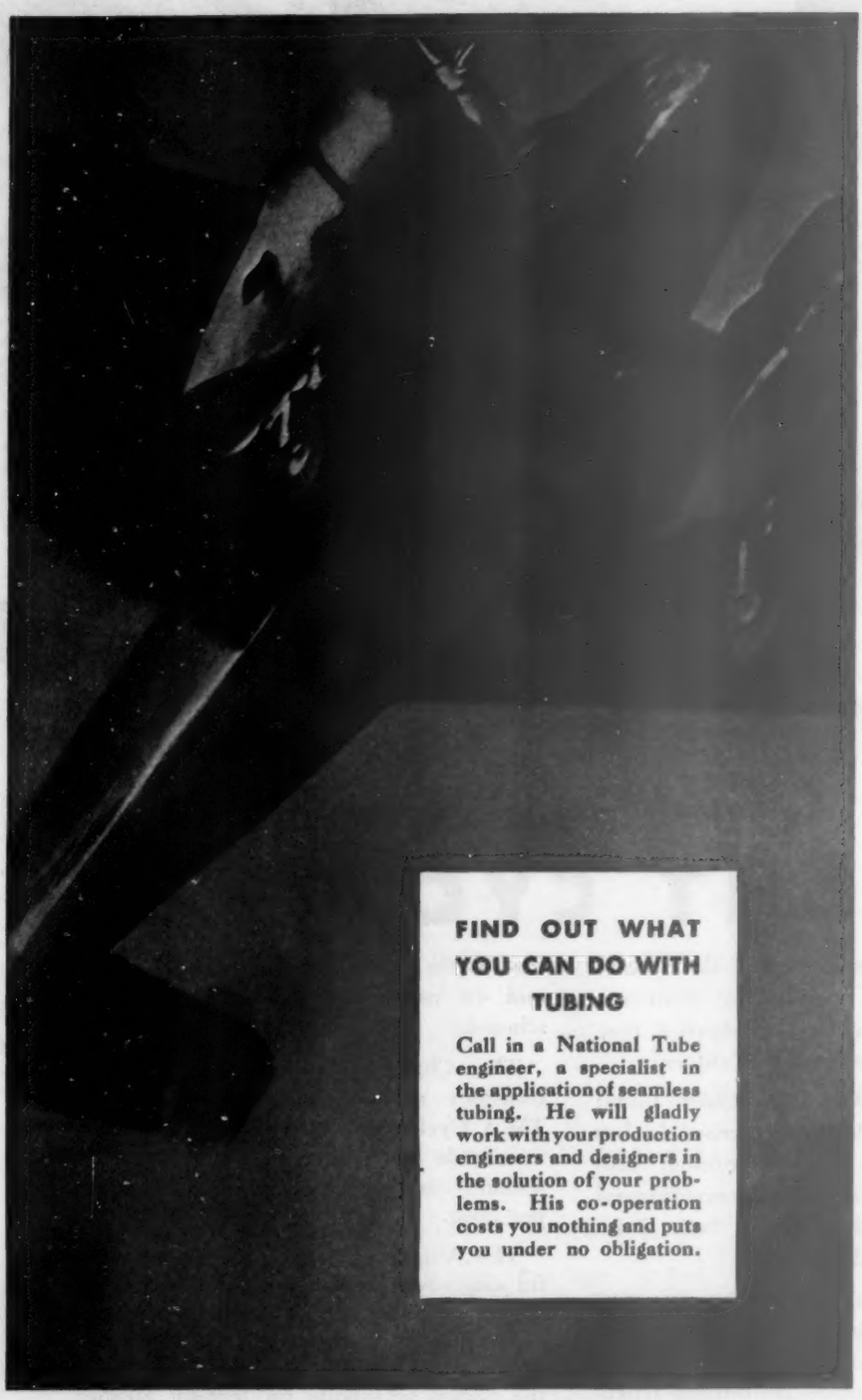
A DIVISION OF CURTISS-WRIGHT CORPORATION

FOR *Happy Landings...*



FIND OUT WHAT YOU CAN DO WITH TUBING

Call in a National Tube engineer, a specialist in the application of seamless tubing. He will gladly work with your production engineers and designers in the solution of your problems. His co-operation costs you nothing and puts you under no obligation.

SHELBY *Seamless* AIRCRAFT TUBING

TO safely absorb the shock of today's fast take-offs and high speed landings — that's a problem!

Struts, hydraulically cushioned, with pistons and cylinders of SHELBY Seamless Aircraft Tubing provide a happy solution. For the light weight, high tensile strength, uniformity and durability of this superior steel tubing offer the designer and builder a service-tested material which combines the maximum of safety, with lightness and superior strength. Its wide latitude in application and excellent machining qualities keep production costs low.

SAFE—because it is structurally sound

SHELBY Seamless Aircraft Tubing, made by America's largest and most experienced manufacturer of mechanical tubing, conforms to the highest standards set by the United States Army and Navy specifications. Available in chrome-molybdenum, mild carbon and stainless steels, both round* and streamline sections. Quick delivery from stock assured by distributors located conveniently at hand. These stocks are carried in specific lots, so that actual test reports which accompany shipments can be furnished for each lot at time of delivery.

*Round Tubing is also available in SHELBY "BF" Aircraft Tubing, which has an improved bright outside finish.

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

are dynamically balanced and differentially controlled and split trailing edge flaps are of the "Wright" type patented by North American Aviation. They are mechanically operated by a very powerful toggle link and the maximum control force required is 8 lb. Flaps can be raised or lowered in eight seconds.

The fuselage is a rugged and simple structure built of chrome molybdenum steel tubing with large doors and openings for maintenance and inspection and forgings and stampings for fittings. Fabric covering is applied in panels for convenience in inspection and servicing. Tail surfaces are full cantilever with stabilizer and elevator interchangeable right and left. The stabilizer is rigidly fixed and trimming is accomplished by a non-reversible type of tab on the elevator. A movement of less than 3 deg. from neutral is sufficient to correct for all average load conditions and the control load is practically negligible. A tab adjustment on the ground is provided for trimming the rudder. Fin and stabilizer are metal covered while the other surfaces are covered with fabric. The fabric-covered removable surfaces are aerodynamically balanced for ease and control and dynamically balanced with built-in weights to prevent flutter at high speed.

Although the ship is normally equipped with non-retractable landing gear, a retractable type is available where maximum performance is desirable. The standard gear is completely cantilever and faired with a simple aluminum alloy structure which does not enclose the wheel. The position of the wheel is sufficiently far forward to make it extremely difficult to nose over in landing. Shock absorbers are of the long stroke oleo type with an air-cushion for taxiing.

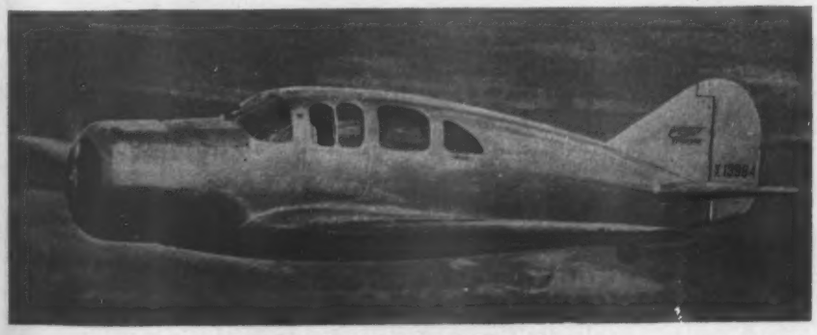
Fixed machine gun installations have been developed and either one of the two synchronized guns may be installed as each installation is a separate unit. Ammunition boxes are removable and may be inserted fully loaded. The flexible machine gun in the rear cockpit is almost completely housed when not in use and has no effect on the performance of the airplane. The mounting is of the track type permitting complete coverage of the rear hemisphere. Absence of tail surface bracing contributes to the effect of this installation.

The Grumman two-seater Pratt & Whitney Wasp C-450 hp. at 6,000 ft. in flight.

New Grumman

Two seater developed for transportation and experimentation

A NEW GRUMMAN BIPLANE, similar in appearance and design to the earlier FF-1 and SF-2 models has made its appearance recently at several airports. The new ship is a two seater and differs essentially from its predecessors in that it is equipped with hydraulically operated split flaps on the upper wings and ailerons on the lower wings. The company plans to use it for experimental work and transportation of executives.



Jacobs powered Spartan Executive.

Spartan Executive

Modern metal plane to be available with Wasp or Jacobs engines

TEST FLIGHTS are now under way on the Spartan Executive, new all metal low wing monoplane soon to be manufactured in commercial quantities by the Spartan Aircraft Company, of Tulsa, Okla. The first ship is powered with the 285 hp. Jacobs engine and a later model, now in the course of construction, will use the 450 hp. Pratt & Whitney Wasp. Production of the four-place Jacobs model will follow completion of flight tests.

Cunningham-Hall GA-36.

Hall Wing

Latest installation is in new GA-36 airplane

LATEST stage in the long period of development of the Hall High Lift Wing is its installation on the new model GA-36 airplane, just completed by the Cunningham-Hall Aircraft Corporation

Map by courtesy of Official Aviation Guide, Inc

American Airlines, Inc.
Boston-Maine Airways, Inc.
Braniff Airways, Inc.
Canadian Airways, Ltd.
Central Airlines, Inc.
Central Vermont Airways, Inc.
Chicago & Southern Air Lines
Delta Air Lines
Eastern Air Lines
Hanford Airlines, Inc.
National Airlines System
National Airways, Inc.
National Parks Airways, Inc.
Northwest Airlines, Inc.
Pan American Airways, Inc.
Pennsylvania Airlines & Transport Co.
Transcontinental & Western Air, Inc.
United Air Lines
Varney Air Transport, Inc.
Wedell-Williams Air Service Corporation
Western Air Express Corp.
Wilmington-Catalina Airline, Ltd.
Wyoming Air Service, Inc.

ROLL CALL!

The roll call of Transport Lines in the United States is a roll call of Pioneer customers. Since the organization of regular scheduled operation more than ten years ago, Pioneer Instruments have been a part of the equipment of every Airliner. To complete schedules regardless of weather conditions, absolute dependence must often be placed on instrument equipment. The splendid record for the maintenance of schedules is proof of the reliability and accuracy of Pioneer Instruments.

PIONEER INSTRUMENTS

PIONEER INSTRUMENT COMPANY, INC. • 754 LEXINGTON AVE. • BROOKLYN, N. Y.
A SUBSIDIARY OF THE BENDIX AVIATION CORPORATION

in Rochester, N. Y. The new airplane is an all-metal, low wing type with full N. A. C. A. cowling. A notable characteristic in the design is the high position of the horizontal tail surfaces.

Installation of the Hall wing in the GA-36 embodies a full span automatic flap in the lower side of the wing and an aileron in the upper surface. Flight tests have indicated that the arrangement provides satisfactory lateral control throughout the entire range of angles of attack including stalling and that the airplane is highly maneuverable under all conditions of flight.

The Hall High Lift Wing is the invention of the two Hall brothers of Rochester and was first introduced during the Guggenheim Competition. Since then it has been under continuous development and has been tested extensively by the company and by the National Advisory Committee for Aeronautics.

R.C.A. Receivers

Two new models embody many improvements

TWO YEARS of pilots' experience with more than 500 AVR-7 and AVR-7-A receivers have resulted in the development of the AVR-7B and AVR-7C models recently announced by RCA. The two new receivers are two-band heterodynes and both cover the 200-400 kc. frequency band for beacon and weather reception. Their essential difference lies in the second band which, in the AVR-7B, is 550-1,500 kc. (broadcast entertainment) and, in the AVR-7C, is 2,200-6,700 kc. (communications).

The chassis used in these models includes a self-contained power supply (full-wave vibrator-rectifier, power transformer, and filters) which operates from the aircraft battery; a remote control system using high-ratio tuning and an improved tuning scale; and all required accessories. The new remote control system permits easy and accurate tuning and embodies an effective reset-ability feature. Current drain is less than 1.4 amp. at 12 volts.

The unusually low power consumption is due in part to the multi-function RCA Radiatrons of which four are used and develop the equivalent of six tube performance. Only a small antenna is needed and the standard aircraft vertical pole or single wire "T" type (longitudinal or transverse) are recommended. Special input filter circuits minimize shielding requirements and a toggle switch controlled static limiter reduces interference from natural causes.

Dimensions of the receiver unit shock mount are 8¾ in. high, 6¾ in. wide, and 10¾ in. long and the control panel face is 5½ in. wide by 6⅝ in. high. Weight of the complete equipment (including remote control, cables, fuse holder, control panel, headphones, and plug) is 23 lb.

R.C.A. receiver and control panel.

Model L-15 Lear-O-Phone.

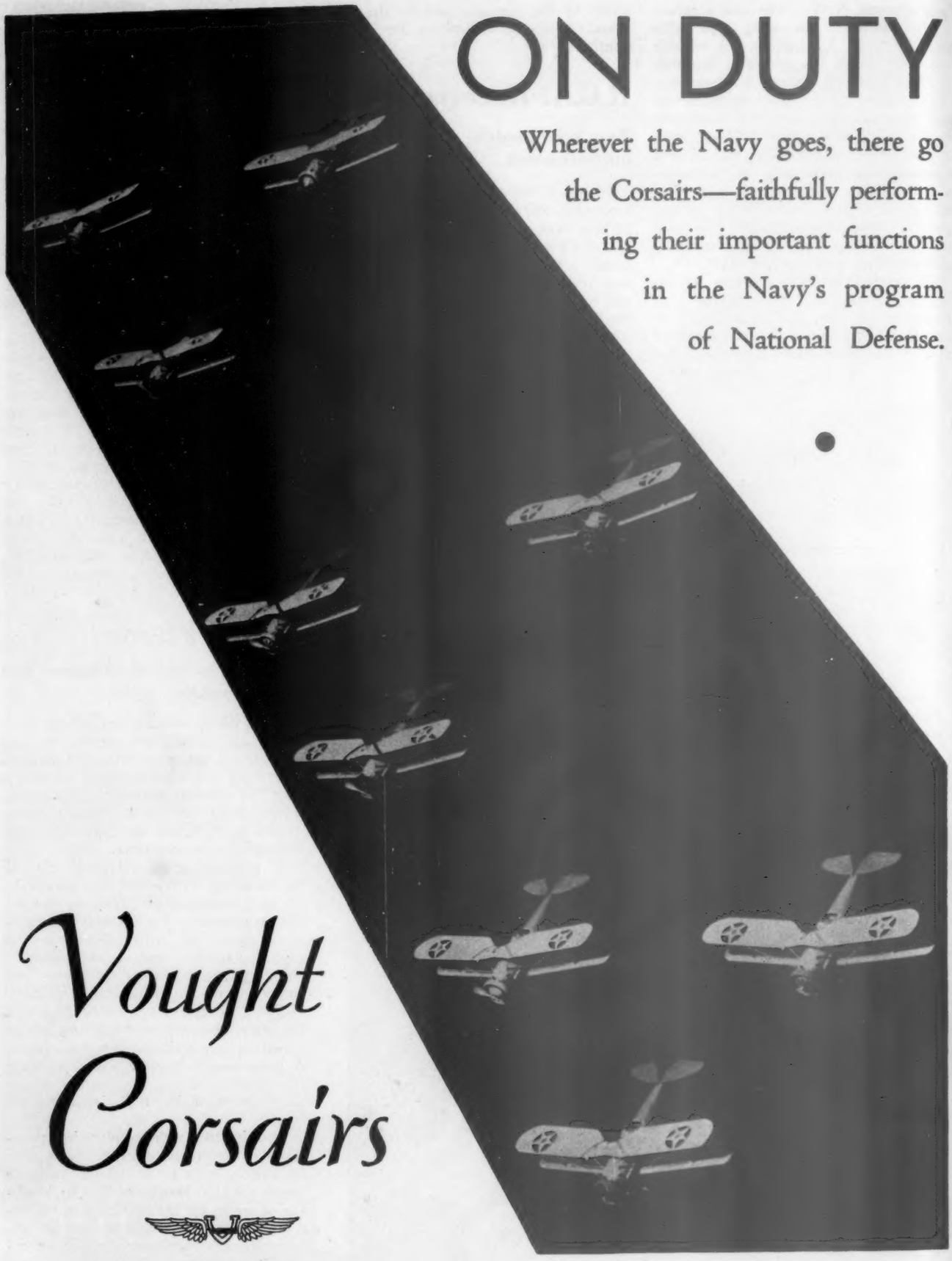
Lear-O-Phone

New transmitter is compact and light in weight

IN ONE of the planes that circled over the "Queen Mary" on her first arrival was Bill Lear, president of Learadio, describing the event for rebroadcast over the Mutual network. His transmitter was the latest Lear-O-Phone, Model L-15 which has just been announced by the company.

A compact unit, weighing only 17 lb. including dynamotor, the Model L-15 has an output of 15 watts, 100 per cent modulated. Total battery drain is 11 amp. at 12 volts. Frequency is crystal controlled and is determined by plugging in the appropriate quartz crystal for any point in the range of 2,900 to 7,000 kilocycles. New beam power amplifier tubes are used and can be obtained in any well-stocked radio store. A press-to-talk microphone, completely adjustable in flight, is a feature of the set. The transmitter unit dimensions are 5 x 5 x 7 in.

In order to match the electrical properties of the transmitter to those of a trailing wire antenna whose effective length may be shortened due to breakage or whipping in flight, all Lear transmitters are now provided with an antenna tuning condenser, locally or remotely controlled. This arrangement provides maximum radiation for the variations in length of the antenna which are inevitable in the use of trailing wire antennae.



ON DUTY

Wherever the Navy goes, there go the Corsairs—faithfully performing their important functions in the Navy's program of National Defense.

Vought Corsairs

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DIVISION OF UNITED AIRCRAFT MANUFACTURING CORPORATION

News of the Month

Highlighting recent events in the aviation world.

★ ***Transport*** **. . . United passes 100,000,000 mile mark . . . PAA to start transpacific schedules.**

★ ***Army and Navy*** **. . . Curtiss, Northrop, Vought, get Navy orders . . . Seversky to build Army pursuits.**

★ ***Development*** **. . . Metcalf, of the Bureau, develops new blind landing system.**

★ ***Gliding*** **. . . Elmira plays host for seventh time.**

★ ***Congress*** **. . . Round-up of the session's work . . . Copeland committee recommends drastic Bureau shake-up.**

★ ***Industrial*** **. . . Bureau reports production gains . . . $630,000 in orders for Lockheed . . . Taylor buys 400 motors.**

★ ***Financial*** **. . . American Airlines financing . . . More stock for Douglas . . . Profit for Consolidated.**

Elmira's Annual

Seventh Annual National Soaring Contestants compete for $4,000 in prizes

ELMIRA, annual mecca for America's gliding and soaring enthusiasts, this year played host to the Seventh Annual National Soaring Contest. As we go to press, no spectacular flights have been made, with the exception of a new altitude record of 6,516 ft., made on the meet's tenth day by Emerson Mehlhose, of Wyandotte, Mich. This compares with Richard C. du Pont's national mark of 6,224 ft., set in 1934.

Most enticing prize this year is the $3,000 put up by A. Felix du Pont, at least $2,000 of which will be awarded. Half of the money, $1,500, will be awarded on a point basis, with $500 reserved for the first altitude flight of the meet to break the record held by du Pont. If any pilot had the luck to reach 10,000 ft. the prize would jump to $1,500. The Vincent Bendix prize of $500 will go to the pilot flying the greatest distance, and will be increased to $1,000 if the national record, set at 158 miles by Richard C. du Pont in 1934, is broken.

Closest contender so far for both individual-performance prizes is Mehlhose, who on the same flight which set the altitude record soared 77 miles to Orson, Pa.

Man-made conditions at Elmira are better this year than ever before. In addition to Harris Hill, traditional soaring site, there are four other hills which can be used for launching, permitting flights almost irrespective of the direction of the wind.

Dr. Karl O. Lange, meteorologist at Harvard's Blue Hill Observatory, and a vice-president of the Soaring Society, has technical charge of the meet, as chairman of the contest committee. An innovation this year is Dr. Lange's use of radio-equipped balloons for recording upper-air temperatures and winds. The balloons are released from the valley below Harris Hill, and send back every-minute temperature readings, which are then flashed to the top of the hill for comparison with conditions prevailing there.

Two German-built sailpianes are being flown this year, one by du Pont, and the other, which has just been acquired by the Elmira Association of Commerce, by Youston Sekella and Wolff von Wernsdorff. Most active day in the first nine was June 28, when 23 gliders and sail planes—the total entry list—were in the air at the same time.

Pictures, Inc.

GOPPINGEN I

at Elmira. Richard C. du Pont prepares for the initial flight of his new German-built sailplane at the Soaring Society's Seventh Annual Meet.

Blind Landing

Metcalf announces new system at Indianapolis meeting.

ON June 5 officials of the Air Corps, Bureau of Air Commerce, Bureau of Standards and representatives of the airlines met with the Blind Landing subcommittee of the Radio Technical Committee, Bureau of Air Commerce, to witness the first comparative tests of two types of blind landing equipment installed on the Indianapolis Municipal

For Positive Control

UNDER SEVERE
TRAINING SERVICE

ROEBLING AIRCRAFT CORD

Roebling-equipped Seversky Trainer

SPECIALLY designed to withstand the vigorous use encountered in training Air Corps Cadets, the Seversky Trainer is an outstanding example of the use of Roebling Control Cable. The utmost in flying safety is assured by this Wire Aircraft Cord... the result of Roebling's 90 years of specialization in the manufacture of wire and wire products. Thus, you will find it is the choice of practically all the principal plane builders.

Roebling Wire Aircraft Products include:— *Tinned Aircraft Wire; 19-wire Aircraft Strand, Tinned or Galvanized; Aircraft Cord (6 x 7, 7 x 7, 7 x 19), Tinned and Galvanized; Ferrules and Thimbles; Serving and Locking Wires; Control Strand and Casing; Power and Lighting Cables; Welding Wire.*

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N.J. *Branches in Principal Cities*

ONLY A FINE PRODUCT MAY JAR BEAR THE NAME ROEBLING

Airport. Both the Department's curved beam and the Army's directional beam-altimeter system have been installed, and the research involves exhaustive tests of both types to determine the one best adapted to transport use. Demonstration flights were made by Bennett H. Griffin of the Department of Commerce.

In the course of the day's meeting Irving R. Metcalf, of the Bureau of Air Commerce, described a new type of blind landing system on which he has been working for many months. Metcalf's system, reduced to its simplest terms, consists of the installation on the ground of three sources of radiation—light, radio, infra-red or what-not. The three radiators are laid out in plan in the form of an equilateral triangle. The radiator which forms the apex of the triangle is placed on the center line of the runway at ground level. The other two sources of radiation form the base of the triangle, are disposed to the right and to the left of the edge of the runway in the direction of the approach, but elevated above the ground sufficiently so that the normal glide path of the airplane lies in the plane determined by the three radiators. Thus the pilot, approaching from the proper direction and at the proper angle, sees (directly, or on a ground glass screen in front of him) three spots of light in line horizontally, and equally spaced. If the approach is made from an improper direction, laterally or vertically or both, the lights will fall into some changing pattern which will yield a direct indication of flight correction to be made. Whether or not the pilot sees the three lights visually through his windshield or whether the radiations are picked up (optically or electrically), and translated into three spots of light on a ground glass screen on his instrument board, the flight principles involved remain the same. The direct light-to-eye system lends itself well to the problem of landing flying boats on water at night. The indirect (radiator to instrument board) system offers a means of making blind landings through fog.

Most important of the advantages of the system is that all of the information necessary to make a blind landing is combined in a single instrument. There is nothing else to watch. The illusion is created (optically, electrically or otherwise) that the pilot looks at a pattern of lights placed on the ground in such a manner as will allow him to make landings according to common visual practice.

Schedules, Traffic, Records

United passes 100,000,000 mile mark; TWA moves its Los Angeles terminal; American to stop at Providence

UNITED AIR LINES passed its 100,000,000 mile mark June 17 with Pilots Lewis M. Gravis, Jack Knight, and E. Hamilton Lee at the controls on the final Newark-San Francisco run. This total was accumulated over a period of ten years, about one-third of it being completed in the last two years. With mileage piling up at the rate of 1,500,000 a month the second hundred million miles should be completed quickly.

To boost space to meet these demands, United President W. A. Patterson has announced that the line will buy from 15 to 25 of the four-engined, 40 passenger Douglases being developed jointly by five airlines.

The Interstate Commerce Commission, on June 6, affirmed the increased pay schedule proposed earlier by the examiners (AVIATION, May, 1936) for NORTHWEST AIRLINES.

May 31 TWA moved its Los Angeles base from Grand Central Air Terminal, Glendale, to Union Air Terminal, Burbank. Half of hangar No. 1 will be used for hostess' and pilots' rooms, and radio equipment and dispatchers' offices will be in the New Annex, built by the terminal at a cost of about $50,000.

A few days after Attorney General Cummings had announced that the long-awaited Ristine Report on 1934's contract cancellations would be delayed pending a decision on "possible litigation," the Post Office Department announced final settlement of the suits of four lines. American, Northwest, TWA, and Western Air Express settled suits aggregating $8,841,094 for $601,511, which represented accrued earnings impounded by the government prior to the effective date of the cancellations, plus the return of performance bonds which had been posted.

With the opening of the Rhode Island State Airport at Hillsgrove, AMERICAN AIRLINES resumed daily New York-Providence and Boston-Providence service. Three round trips a day are made between New York and Providence, one of them continuing on to Boston.

With the approval of the Post Office Department, Thomas Fortune Ryan, III, has purchased 51 per cent of the stock of Hanford Airlines.

All CENTRAL planes operating in Cleveland are serviced by General Airmotive Corp., which assumed its new duties June 1.

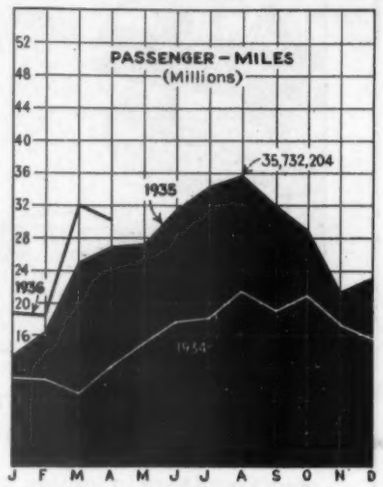
The ICC has set July 13 as the date for hearings on EASTERN'S complaint against AMERICAN. DELTA'S plea for more mail pay will be heard the same day.

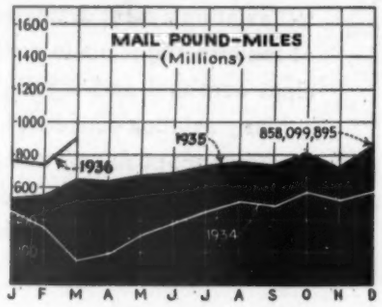
Calendar

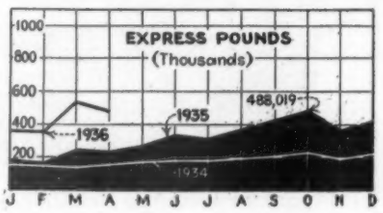
Aug. 1—Western Canada Annual Air Show, Vancouver, B. C.
Sept. 4-5-6-7—National Air Races, Los Angeles, Cal.
Oct. 25—Paris-Saigon Air Race.
Jan. 28-Feb. 6, 1937—Aircraft Show, New York.

Traffic

Latest available statistics from the Bureau of Air Commerce and the Post Office Department—Domestic airlines only



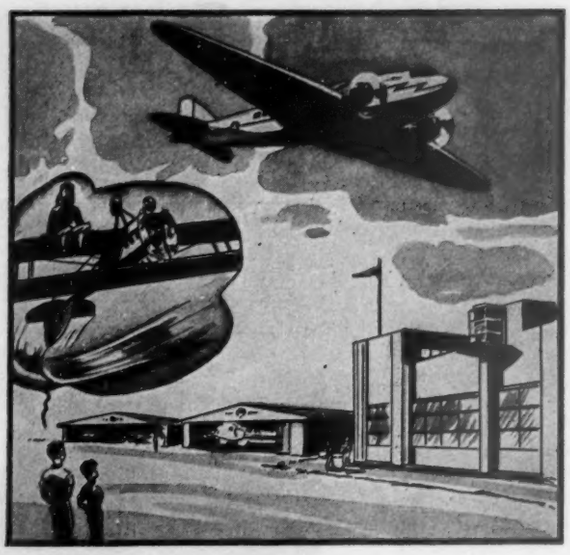




Copeland Reports

Senate committee recommends "thorough overhaul" of Bureau

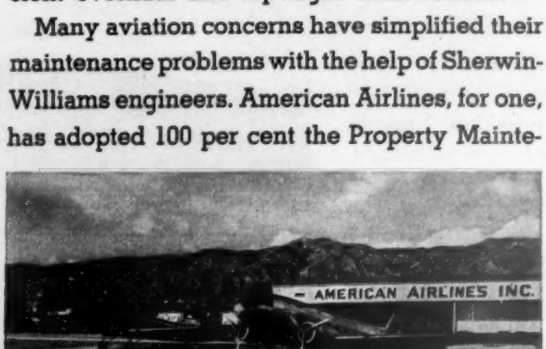
THE CRASH of TWA's Flight 6, which killed Senator Cutting at Kirksville, Mo., a year ago last May netted the Bureau of Air Commerce investigation 907 pages of testimony, which boiled



"MEBBE IT IS SAFER, BUT THE BARNSTORMIN' DAYS WAS MORE EXCITIN!"

Few people are interested in figures, yet figures tell aviation's most dramatic story . . . the story of modern flight made swift and sure by efficient overhaul and top-flight maintenance.

Many aviation concerns have simplified their maintenance problems with the help of Sherwin-Williams engineers. American Airlines, for one, has adopted 100 per cent the Property Maintenance Paints and Painting Service of the largest paint company—Sherwin-Williams. S-W paints cover the hangars, buildings, terminals, and other structures of American Airlines in 57 cities. Good paint protects A-A's equipment and makes for more efficient shop work.



The services of S-W engineers are available without cost on all problems of painting and finishing, hangar and shop maintenance. Write to The Sherwin-Williams Co., Cleveland, Ohio.

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AEROPLANE FINISHES

SEE THE SHERWIN-WILLIAMS FINISHING ENGINEER

SCINTILLA

AIRCRAFT MAGNETOS

Provide thoroughly reliable ignition for the entire fleet of twin-engined Lockheed Electros operated by

NORTHWEST AIRLINES

Northwest's 1935 record of 2,841,198 flight miles, carrying 25,123 passengers, 648,492 pounds of mail and 72,422 pounds of express, is an achievement in which we are justly proud to have had a part.

☆

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MAGNETO COMPANY, INC.
(Subsidiary of Bendix Aviation Corporation)
SIDNEY, NEW YORK

down to a statement of five "probable contributory causes." On only one count —weather prediction—was the government found at fault.

Also resulting from the crash was action by the Senate. S. Res. 146 put Senator Royal S. Copeland at the head of a subcommittee of the Committee on Commerce, handed him his orders to conduct a quadruple-barreled investigation of this crash in particular, airline safety in general, the set-up of the Bureau, and the personnel of the Bureau.

Late last month, tucked away in the Congressional Record in the rush of adjournment, the Copeland Committee's preliminary report was published.

The Copeland report differed from the Bureau's findings in that it blamed failure of three Federal aids: the Kansas City beam, the Kirksville marker, and the Kirksville beacon lights.

Regarding its investigation of the Bureau itself, the committee found Director Vidal possessed of the necessary aeronautical experience and background for his job, but was lacking in business experience. They found him "an amiable gentleman. . . . Our fear is that he is too amiable, that he is lacking in iron, positiveness, and the determination to keep the employees under his direction functioning according to schedule."

Strongest language used in the report was directed against Rex Martin, Chief of the Air Navigation Division. The committee questioned his "professional equipment and preparation," suggested "a larger man is needed."

General recommendations were that the Secretary of Commerce . . . "thoroughly overhaul the Bureau of Air Commerce with a view to improving its administrative officials."

Men, Motors, Money

Engines for Taylor; Seversky to issue stock

WITH an order backlog of more than $630,000, LOCKHEED AIRCRAFT CORP., Burbank, Cal., has taken an option on land bordering Union Air Terminal, and plans to erect buildings providing from 100,000 to 125,000 sq.ft. of additional floor space. The plant employs 600, and more men with technical training are needed. Eleven twin-engined ships—Electras and the new Lockheed 12—are on order. During the first four months of this year eight planes, costing a total of $400,000, were delivered.

BELL AIRCRAFT CORP., Buffalo, has about 400 men at work turning out wing panels under its $800,000 contract sublet by Consolidated Aircraft last February.

CONSOLIDATED AIRCRAFT CORPORATION has leased an additional 90,000 ft. of land at its San Diego factory. Additions, to cost about $600,000, will consist of a large addition to the main plant and four new buildings.

MENASCO reports orders on hand for the year running ahead of last year's total. About ten of the C4 "Pirate" 125 hp. engines are being shipped per month.

REARWIN AIRPLANES, INC., has moved into larger quarters at Fairfax Airport, Kansas City, Kansas.

An order for 400 Continental 37 hp. motors for installation in Cubs has been placed by TAYLOR AIRCRAFT. The company will spend $25 per motor in an effort to jack horsepower up to 40. With the demand for Cubs running ahead of the supply, the company will turn out more planes in the first six months of this year than were produced all last year.

SEVERSKY AIRCRAFT has filed a registration statement with the Securities and Exchange Commission for the sale of stock which will net the company more than $3,000,000. This was "in anticipation of new business," part of which was already secured in the recent Army order for pursuits.

The Bureau of Air Commerce has approved the self-locking screw threads of the DARDELET THREADLOCK CORPORATION for use in licensed aircraft provided the parts are fabricated from material specified by the aircraft manufacturer in his approved technical data.

The Bureau of Air Commerce reports a 33⅓ per cent gain in aircraft production during the first quarter of 1936 compared with the same period last year: 456 against 349.

License to manufacture Beechcrafts in Japan has been granted Japan Air Transport Company, of Tokyo, by the BEECH AIRCRAFT COMPANY of Wichita, Kan. A C17E Beechcraft has been ordered by the Japanese concern.

Pursuits, Bombers

Seversky, Northrop, Vought, Curtiss orders total 268 planes

THE first of several new service orders, announced by the Navy called for 191 dive bombers and scout bombers, but the Navy did not reveal prices. Biggest slice—83 two place scout bombers (VSB) —went to Curtiss Aeroplane & Motor.

To Northrop went a contract for 54 dive bombers (VB). The remaining 54, also of the dive bomber (VB) type, went to Chance Vought.

The Army order, let June 16, was for 77 single-seat pursuits and spare parts equivalent to eight more. It went to Seversky—third low bidder in the recent design competition at Wright Field in which Curtiss, Chance Vought and Consolidated also had entries. The contract price, less engines, was $1,636,250.

Power for all the planes, both Army and Navy, will be supplied by Pratt & Whitney engines: for the Navy, 700 hp. Twin Wasp Juniors; for the Army, the new 1,000 hp. Twin Wasps. Propeller requirements will also be standard for all 268 ships: Hamilton Standard Constant Speed.

Financial

New Douglas issue: American to issue equipment trust certificates

WITH CONTRACTS for 144 planes from the Navy, American Airlines and United Air Lines since the first of the year, DOUGLAS AIRCRAFT needs working capital. To secure it, the company, on June 15, filed a statement with the Securities and Exchange Commission proposing the issuance of 93,480 shares of capital stock at no par value. The shares will be offered to present stockholders at the ratio of one to each five now held.

CONSOLIDATED finished the first quarter of this year with a profit of $3,730.

AMERICAN AIRLINES, to finance purchase of its twenty new Douglas DC-3s, plans to enter a field new to the aviation industry: equipment trusts. The equipment trust certificates, to be bought by the RFC, will aggregate $1,440,000—60 per cent of the cost of the planes. They will be amortized, at a yearly interest charge of 5 per cent, in four years—a write-off of about $30,000 per plane per year.

American will receive assistance in purchasing its new Flagships—over and above the RFC loan—from its parent company, Aviation Corporation. The line's 1935 financial statement shows a loss of $748,370, compared with a 1934 loss of $2,313,678.

HAMILTON STANDARD'S
proposed new 100,000 sq.ft. addition at East Hartford. Orders calling for annual production of 2,500 propellers made it necessary.

Aviation in Congress

BILLS PASSED BY BOTH HOUSES

Number of Bill	Introduced by	Purpose
S.3055	Walsh (Mass.)	Specifying conditions of labor on government contracts over $10,000. Awaiting President's signature.
S.4020 H.R.10708 H.R.11039	Johnson (Cal.) Carter (Cal.) Carter (Cal.)	Construction of a naval air station at Alameda, Cal. Senate Bill signed by the President June 25; House bills still in committee.
H.R.8372	Wilcox (Fla.)	To authorize acquisition of land at Miami, Fla., for a naval air station. Passed both Houses, but vetoed June 1 by the President.
S.4309 H.R.11920	Sheppard (Tex.) McSwain (S.C.)	To increase the efficiency of the Air Corps Reserve. Public Law 691.
H.R.11140	McSwain (S.C.)	Authorizing Air Corps increase in next five years to 4,000 planes. Signed by the President June 25.
H.R.11960 H.R.10662	McSwain (S.C.) McSwain (S.C.)	To organize an Air Reserve Training Corps. H.R.11960 passed both houses, vetoed by the President. H.R.10662 still in committee.
H.J.Res.488 S.J.Res.206 H.J.Res.484 S.J.Res.210	McKellar (Tenn.) McSwain (S.C.) Reynolds (N.C.)	To close Military Road on Washington-Hoover Airport. Signed by the President. Public Resolution 75.
S.3737	Sheppard (Tex.)	To acquire by donation land at or near Newburgh, New York, for a military aviation field. Signed by the President. Public Law 581.
S.Res.237		To grant the Copeland Committee an additional $25,000. Passed and cut to $10,000.
S.2496	Black (Ala.)	To amend Railway Labor Act to include air line pilots and place them under Railway Labor Board. Signed by the President. Public Law 487.
H.R.3806	Smith (Va.)	To appoint a commission to establish an airport in the District of Columbia. Signed by the President and commission appointed.
H.R.8555		To establish a system of government subsidies for the construction and operation of a merchant marine, and to investigate the application of such subsidies to aircraft. Signed by the President June 30.

BILLS PASSED BY ONE BRANCH OF CONGRESS

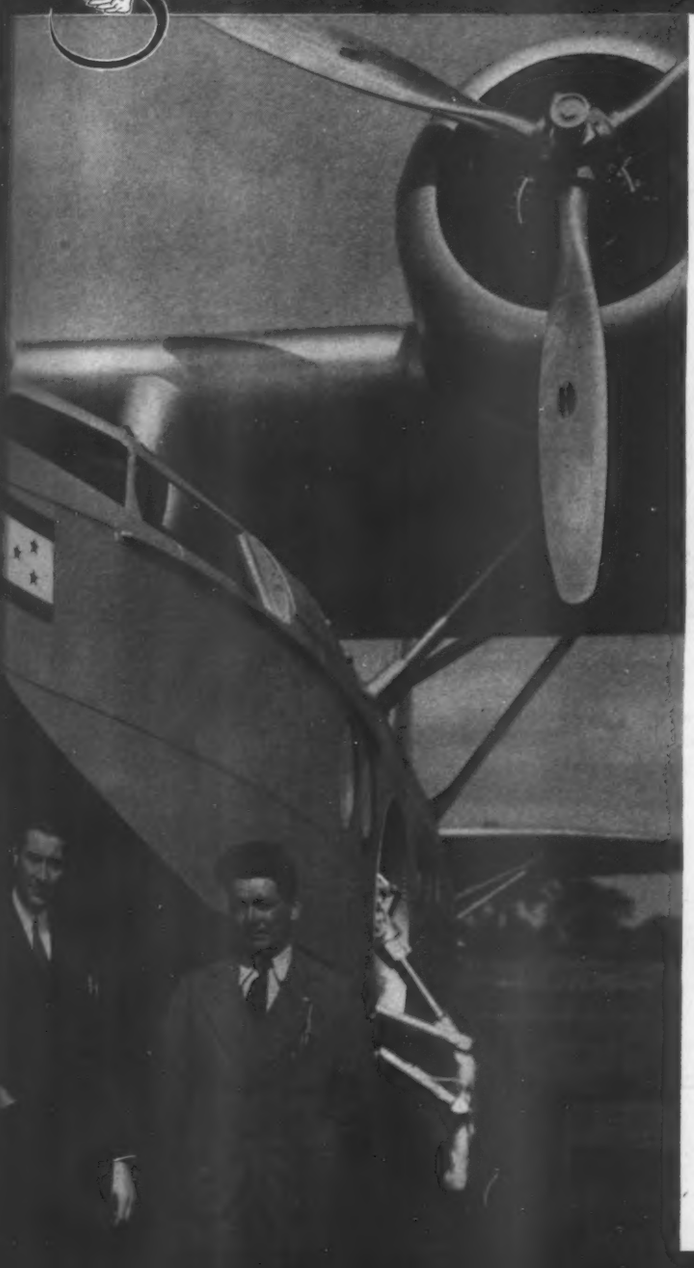
H.R.12009 H.R.11803	Merritt (N.Y.) Merritt (N.Y.)	To authorize the enlargement of Governors Island, N. Y., as a landing field for the city of New York. Passed the House; still in committee in the Senate. H.R.11803 still in committee in the House.
S.3398		To transfer the Air Corps Technical School from Rantoul, Ill., to Denver, Col. Passed the Senate Jan. 30; failed in the House.
S.2926		To authorize study and dissemination of findings regarding aviation instruction courses for the public schools. Passed the Senate March 26.

BILLS FAVORABLY REPORTED OUT OF COMMITTEE

H.R.10129 S.3498	Mott (Ore.) McNary (Ore.)	Appropriation for naval air base, Tongue Point, Oregon. Reported April 23 in House. Still in committee in Senate.
S.3974 H.R.11080	Sheppard (Tex.) McSwain (S.C.)	Defining a flying officer. Reported in Senate Feb. 24. Still in committee in House.

BILLS STILL IN COMMITTEE

H.R.12754	McFarlane (Tex.)	For a naval air station at Galveston, Texas.
H.R.12686	McLaughlin (Neb.)	Authorizing contract airplane observation flight services.
H.R.12457 S.4580.	Powers (N.J.) Moore (N.J.)	To require parachutes in all aircraft carrying passengers for hire.
H.R.12682	O'Connell (R.I.)	Authorizing construction and operation of two dirigibles (Respess).
H.R.12894 S.3420	Hildebrandt (S.D.) McCarron (Nev.)	To transfer functions of Bureau of Air Commerce to the Interstate Commerce Commission.
H.R.12159	Maas (Minn.)	Providing that Navy and Marine Corps line officers, if detailed to aviation duty, must have at least ten years' aviation experience.
H.R.11397 S.4098	Harter (Ohio) Bulkley (Ohio)	To promote the development of lighter-than-air craft. (Authorizes expenditure of $5,000,000.)
S.J.Res.211 H.J.Res.468	Johnson (Cal.) McGrath (Cal.)	For preparation of plans and designs for two lighter-than-air craft.
H.R.2744 H.R.10186	O'Connell (R.I.) O'Connell (R.I.)	Authorizing construction of a 300 ton airship for military service.
H.R.12254	Maas (Minn.)	For promotion of Naval and Marine Corps aviators on the retired list.
H.R.11971	McSwain (S.C.)	To promote the efficiency of the Air Corps.
H.R.10488	Kenney (N.J.)	To establish an Army air base at Teterboro, N. J.
H.R.11005	Tonry (N.Y.)	To provide that aircraft for the Army, Navy, and Coast Guard shall be constructed by domestic firms with citizen employees.
H.R.11280	Maas (Minn.)	To provide that pilots employed by companies carrying mail by aircraft shall be organized as an aviation reserve.
S.J.Res.212 H.J.Res.478	Norbeck (S.D.) Gillette (Iowa)	Authorizing the construction of lighting facilities and radio aids on Air Mail Route No. 26.
H.R.11988	Tolan (Cal.)	To establish and maintain aids to air navigation on the transpacific route between San Francisco and Manila.
H.R.10320	Mead (N.Y.)	To revise air mail laws.
H.R.11952	Dobbins (Ill.)	To amend the Foreign Air Mail Act of March 2, 1929.
H.Res.480	McMillan (S.C.)	To create a standing committee of the House, to be known as the Committee on Air Commerce and Civil Aviation.
H.Res.399	Ellenbogen (Pa.)	To create a committee of seven members to investigate air accidents.
H.Res.261	Mead (N.Y.)	Authorizing investigation of safety aids of companies holding mail contracts.
H.Res. 483	Kenney (N.J.)	Creating a committee to investigate aviation industries engaged in interstate commerce.



SIKORSKY S-43

OPENS AIRLINE SERVICE ON AFRICAN WEST COAST

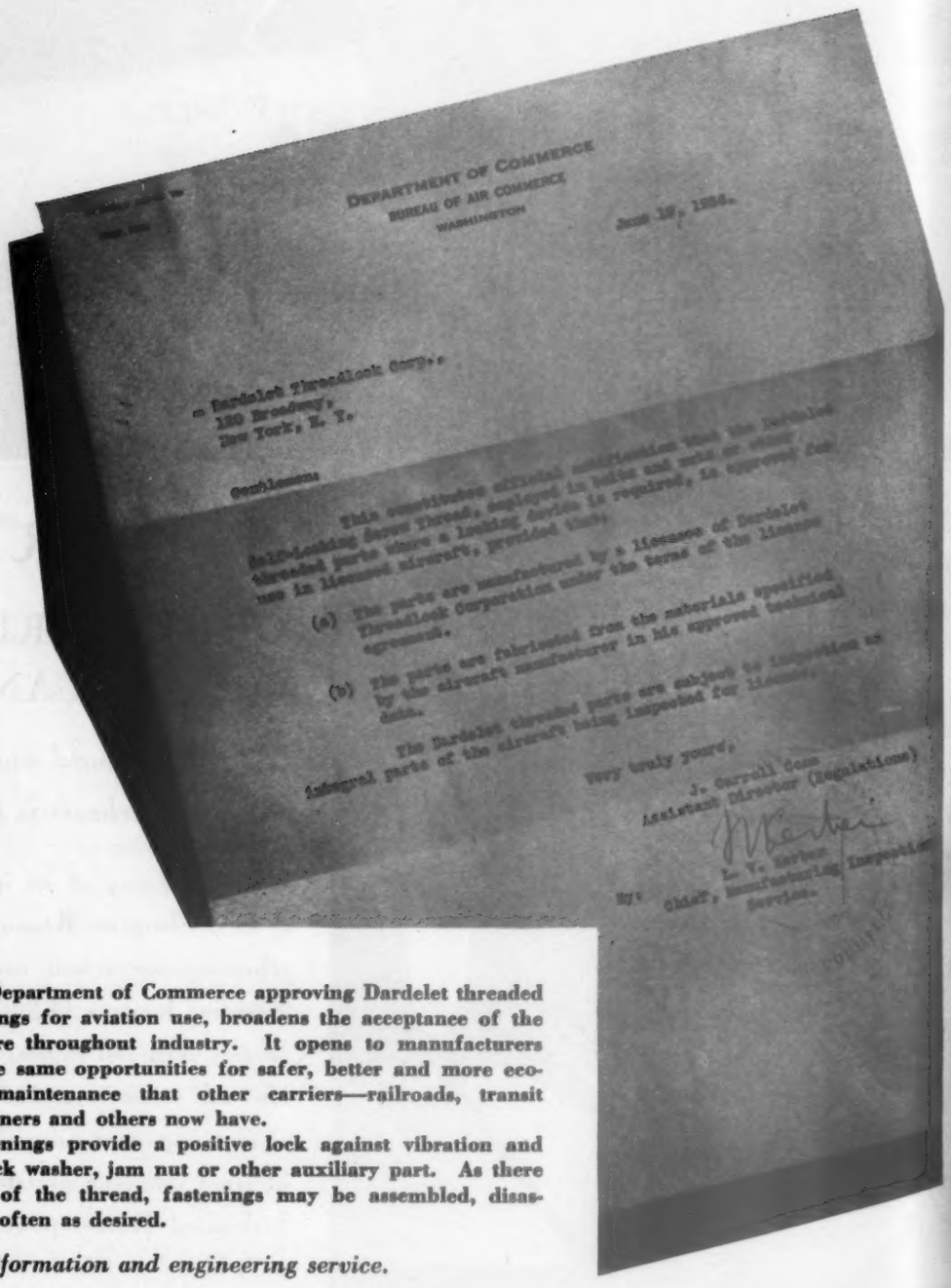
The world-wide use of Sikorsky airliners is further extended

Taking delivery of its initial fleet of three Sikorsky S-43's, Chargeurs Réunis inaugurates a brilliant airline schedule over a vast stretch of coastal West Africa. Speeding between Dakar and Pointe Noire with passengers, mail and express, these world-famous amphibions will service over 3000 miles of coast line, touching at nine important colonial ports. Careful consideration of latest transport aircraft resulted in the choice of the high speed Hornet-powered Sikorsky S-43, equipped with Hamilton Standard Controllable Pitch Propellers.

SIKORSKY AIRCRAFT
BRIDGEPORT, CONNECTICUT
DIVISION OF UNITED AIRCRAFT MANUFACTURING CORPORATION

(Left) Pierre Janet, Operations Manager and Pilot
(Right) Lucien Hervieu, Pilot

And now — AVIATION


DEPARTMENT OF COMMERCE
BUREAU OF AIR COMMERCE
WASHINGTON

June 19, 1936.

Dardelet Threadlock Corp.,
120 Broadway,
New York, N. Y.

Gentlemen:

This constitutes official notification that the Dardelet Self-Locking Screw Thread, designed in holes and nuts or other threaded parts where a locking device is required, is approved for use in licensed aircraft, provided that:

(a) The parts are manufactured by a licensee of Dardelet Threadlock Corporation under the terms of the license agreement.

(b) The parts are fabricated from the materials specified by the aircraft manufacturer in his approved technical data.

The Dardelet threaded parts are subject to inspection as integral parts of the aircraft being inspected for license.

Very truly yours,

J. Carroll Cone
Assistant Director (Regulations)

By: E. V. Burton
Chief, Manufacturing Inspection Service.

The above letter from the Department of Commerce approving Dardelet threaded bolts, nuts and other fastenings for aviation use, broadens the acceptance of the Dardelet Self-Locking feature throughout industry. It opens to manufacturers and operators of aircraft the same opportunities for safer, better and more economical construction and maintenance that other carriers—railroads, transit systems, automotive fleet owners and others now have.

Dardelet threaded fastenings provide a positive lock against vibration and shock, without cotter pin, lock washer, jam nut or other auxiliary part. As there is no permanent distortion of the thread, fastenings may be assembled, disassembled and reassembled as often as desired.

Write for information and engineering service.

DARDELET THREADLOCK CORPORATION

120 Broadway, New York, N. Y.

Chicago Office: **205 W. Wacker Drive** ***Detroit Office:*** **424 Book Bldg.**

Schools, Services, and Airports

A state-by-state tour of the flying fields

● ALABAMA — Asa Rountree, ALABAMA's assistant director of aeronautics, reports that the Aviation Commission has visited more than 40 towns in the State to make preliminary arrangements for WPA construction work during the next fiscal year. . . . WPA has installed a new 2,400 ft. concrete runway and a 350 ft. concrete apron and taxi strip at MOBILE airport at a cost of $69,000. . . . TUSCALOOSA will have a new 80x120 ft. hangar as part of a $54,000 WPA improvement program.

● ARIZONA—The PHOENIX City Commission has established a municipal aeronautics commission to assist in the operation of Phoenix Sky Harbor. . . . Forty planes were expected to participate in an air show at Ernest A. Love Municipal Airport, PRESCOTT, late in May. Prize money available amounted to $200. Each plane entering would be eligible for 15 gal. of gasoline free. . . . Carl C. Knier and Loyal T. Penn are partners in the reorganized Sky Harbor Air Service, PHOENIX.

● ARKANSAS—The Centennial Commission is planning an airshow at Toney Field, PINE BLUFF, July 11-12, as part of the centennial celebration. Arrangements are in charge of Ted Fordon and Bert Brown. It is planned to hold the annual State Air Tour at the same time, so that the planes will land on the Pine Bluff field on the first day of the tour.

● CALIFORNIA—Construction of an airport on Yerba Buena Shoals, in SAN FRANCISCO Bay, will be carried out during 1936 with a $4,209,609 PWA fund. . . . Plans are being laid for the dedication of DEL MONTE's new $100,000 airport in July. . . . WPA will construct a $14,000 hangar at OROVILLE Municipal Airport. . . . A hill at the east end of the runway at Clover Field, SANTA MONICA, is being leveled by the WPA. Two 200 ft. wide runways will be built.

● COLORADO — The DENVER City Council is considering an ordinance to prohibit pleasure flights over the city between 10 p.m. and 5 a.m. A similar law was introduced last fall, but failed to pass.

● CONNECTICUT — Commemorating the signing of Connecticut's first aviation law on June 8, 1911, the Department of Aeronautics, under the direction of Commissioner Charles L. Morris, sponsored a celebration weekend early in June. A tour of the State was made June 8 in a Boeing transport furnished by United Aircraft of EAST HARTFORD. Next day HARTFORD played host to many of Connecticut's aviation notables, including Donald L. Brown, president of United, Charles W. Deeds, president of United Aircraft Export, Raycroft Walsh, general manager of Hamilton Standard Propeller, and Bernard L. Whelan, vice-president of United Aircraft, who piloted the Boeing on its State tour. . . . First plane to land at Brainard Field, HARTFORD, since the spring floods was a Taylor Cub piloted by T. P. Matusewic, president of Aviation Service Co., Inc., which has been named Connecticut distributor of the Taylor Aircraft Co. Aviation Service operates an approved repair station and a charter service. Two WPA projects, aggregating $202,913, are under way at the field. They will provide for enlargement and general grading and drainage work. A third project, for the construction of an administration building, is pending. Reconstruction work is progressing rapidly under the personal direction of Aviation Commissioner William Wormsted and other members of the Commission and Frank Hendron, airport manager.

BIRMINGHAM MUNICIPAL AIRPORT
was the scene of the city's Sixth Annual National Air Carnival June 6 and 7. The field is the home port for twenty planes, twelve of them owned privately, the rest by four commercial operators.

● DISTRICT OF COLUMBIA — At the close of the fourth annual Langley Day air meet, held at COLLEGE PARK, Md., in May, Harrison Somerville was awarded the Washington Air Derby Association Trophy as "the person who has done the most during the year to promote aviation in Washington."

● FLORIDA — The State Road Department's plane has been equipped by the WPA with a radio sending and receiving set. It has recently been licensed by the Federal Communications Commission. . . . A $23,000 WPA project for construction of a seaplane ramp at Peter O. Knight Airport, TAMPA, was scheduled to start early in May.

● GEORGIA—Plans are being drawn for a hangar at ALBANY Airport, to be built with $5,416 in WPA funds if the program continues after the end of the present fiscal year. Lighting fixtures and equipment for the field are already on hand. . . . The VALDOSTA Chamber of Commerce is preparing a map of Valdosta Airport for the Bureau of Air Commerce to show suggested improve-

Perpetually modern
...reliable...efficient

AIRPORT EQUIPMENT

WHEN buying airport equipment, be sure that the instruments you purchase are not only modern now, but can be kept so at minimum expense. This important necessity is a feature of RCA equipment, which is so designed in coordinated units as to make expansion and modernization simple and economical.

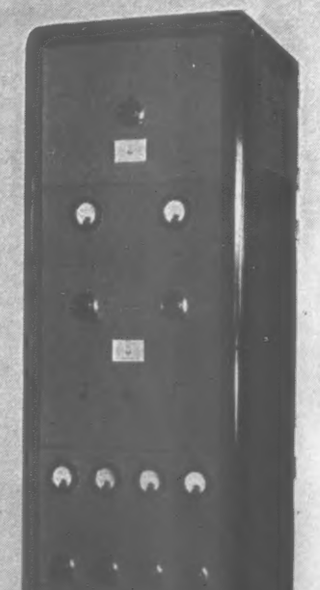
For instance, it may well be that considerations of use and economy will lead you to believe that a radio telephone transmitter will be adequate. For this purpose we have the AVT-1A, especially designed for traffic control. An important feature is the provision for use of its audio system with loudspeakers for paging, making announcements, etc., around the port.

When traffic grows and additional radio facilities are indicated, it is not necessary to dispose of AVT-1A. It may be retained, and AVT-8, a linear 100-watt amplifier, mounted upon it. On that may be placed the AVA-3, runway localizer. You then have a complete radio telephone-telegraph and beacon transmitter, offering traffic control, low ceiling approach and landing facilities and public address.

The RCA unit system not only permits you to acquire these facilities in steps, at low cost, but also provides for economical future changes to incorporate modern improvements when desired. We believe this to be the most satisfactory basis for airport equipment. For details, demonstration or purchase, address:

AIR ASSOCIATES, INC., Glendale, Calif.; Chicago, Ill.; Garden City, L. I.; or write direct to Aviation Radio Section, RCA Manufacturing Co., Inc., Camden, N. J., a Service of Radio Corporation of America

RCA AVT-1A radio telephone traffic control transmitter, the basic instrument in airport equipment. May be used to energize an airport public address system as well as direct traffic.



RCA 125-watt equipment, consisting of the AVT-1A, plus the AVT-8 linear 100-watt amplifier, and the AVA-3 runway localizer, illustrating RCA flexibility and non-obsolescence.

RCA *Aviation Radio*

ments. Recommendations include installation of beacon lights, grading, building up the runways, and laying drains. . . . Strachan Skyways, Inc., SAVANNAH Municipal Airport, is seeking from the Bureau of Air Commerce an approved type certificate for its repair station. Bob Herron, a licensed airplane mechanic, has been employed.

● ILLINOIS—The Air Aces, including Capt. Dick Granere, Art Davis, Roger Don Rae and Bob O'Dell, were scheduled to put on an air show at PEORIA Airport early in June. . . . The Illinois State Bar Association held an aviation dinner in PEORIA late in May. Addresses were given by Major Reed Landis and Col. John H. Wigmore. . . . DECATUR Junior Association of Commerce sponsored an air show at Decatur Airport late in May. . . . Frank Fleck, SPRINGFIELD Municipal Airport, has been named Springfield distributor for Taylor Cubs.

● INDIANA — The TERRE HAUTE Junior Chamber of Commerce sponsored an air show early in May. . . . Louis Schwitzer, Jr., has been elected president of the INDIANAPOLIS Aero Club, to succeed his father. The club has a membership of more than 100. Other officers: T. E. Frankenfield, vice-president; Frank Rippingille, secretary; Shirley McKittrick, treasurer, and Irma Kingsford, sergeant-at-arms. . . . The WPA has released $24,000 for construction of runways at Paul Baer Municipal Airport, FORT WAYNE. . . . H. Weir Cook has been named president of a new company, General Aeronautics, Inc., at INDIANAPOLIS. The company will be distributor for Porterfield and Ryan planes, and will conduct a flying school.

● IOWA—The pole erected on farmland adjacent to the IOWA CITY Airport, to compel planes landing at the port to fly at least 30 ft. high, has been removed. In an agreement reached between the farmer who erected the pole and the State Aeronautics Commission, the commission notified all the pilots in the State that they must maintain an altitude of at least 30 ft.

● KANSAS — The WICHITA Aviation Club held its May meeting at the factory of the Beech Aircraft Co., as the guests of Walter Beech.

● KENTUCKY—The Aero Club of Kentucky and the LOUISVILLE Junior Board of Trade were planning sponsorship of a ten-city aerial tour for the middle of June, starting at Louisville, and touching OWENSBORO, BOWLING GREEN, GLASGOW, MONTICELLO, WILLIAMSBURG, MIDDLESBORO, DANVILLE and LEXINGTON. In charge of arrangements are Shirley Lawrence, Maj. J. C. Bennett, Jr., George Fairleigh, Edwin D. Wood, and Col. Rogers Schupp.

● MASSACHUSETTS — WESTFIELD City Council is considering an appropriation of $8,000 for acquisition of Barnes Airport. The field was originally to have been bought jointly by Westfield and HOLYOKE, but Holyoke has refused to appropriate the $14,000 necessary. . . . The Massachusetts Committee on

THE WINNERS

of Aviation's awards in the Eighth Annual Connecticut Model Airplane Meet: Griffith Bedworth, first, Paul Baudner, second, Catherine Clark, third.

Aeronautics is planning installation of blind landing equipment at EAST BOSTON Airport. . . . Charles P. O'Connor, manager of Barnes Airport, WESTFIELD, reports the sale of three planes recently: one Avro and two Buhl Sportsters.

● MICHIGAN — Walter Arntzen, of ESCANABA, is planning establishment of a taxi service between Escanaba and WASHINGTON ISLAND. . . . Work on the airport in MARQUETTE COUNTY is scheduled to be finished by July 1. Plans call for runways and a 100x117 ft. hangar. $43,235 has been allotted the project by the WPA. . . . Ralph O. Helgeby, president of the FLINT Pilots' Club, led a three-plane flight from Bishop Airport, Flint, to PORT HURON late in May. Pilots of the other planes were Avery Falkenhagen and Robert Dow. . . . The second annual Michigan Airport Conference, held this year in TRAVERSE CITY, will be held next year in GRAND RAPIDS. . . . Elmer Westerlund, manager for more than six years of Reynolds Airport, JACKSON, has resigned as of July 1, and will enlarge his commercial activities at the field, probably opening a flying school. His successor will be chosen by civil service examination. . . . The brick administration building at ANN ARBOR Airport was scheduled to be completed early in June. It will contain offices, waiting room, and lockers for visiting pilots. The 120 acre field has six runways, up to 2,800 ft. long.

● MINNESOTA—An allotment of $41,000 has been made by the WPA for improvement work at Williamson-Johnson Municipal Airport, DULUTH. Plans call for surfacing of runways, seeding, draining, and erection of a 126x80 ft. hangar. Runways will be 3,000 and 3,500 ft. long.

● MISSISSIPPI — New manager of Key Field, MERIDIAN, will be Jimmie Parker. Fred Key has taken a position with the MacMillan Petroleum Corp., ELDORADO, Ark. . . . The WPA is improving nineteen airport sites in MISSISSIPPI.

● MISSOURI—The aeronautical committee of the KANSAS CITY Chamber of Commerce is urging improvement of Kansas City Airport. . . . The ST. LOUIS Airport Association is sponsoring a series of parachute jumps this summer at Lambert-St. Louis Municipal Airport, to be made by Lee Chamblin. . . . Milton D. Girton has resigned as manager of Lambert-ST. LOUIS Field, and Maj. Ralph Page appointed in his place. . . . The SPRINGFIELD Park Board is considering leasing the hangar and fuel concessions at Springfield Airport to the Springfield Aviation Company.

● NEBRASKA—With a change in city administration, control of the OMAHA Municipal Airport has been shifted from the park department to the finance department.

● NEW HAMPSHIRE—A new company, Winnipesaukee Air Service, Inc., has been formed to operate seaplanes on LAKE WINNIPESAUKEE starting July 1. New ramps are being constructed at WEIRS, ALTON BAY, and WOLFEBORO. Pilots will be Robert S. Fogg, in his fourteenth season at the lake, Winsor Harlow, Andrew Cannon and Jack MacManus, who will be in charge of the Alton Bay base. Equipment will be a new five-place Beechcraft, a new five-place Waco, a three-place open Waco, and a two-place Fleet.

● NEW JERSEY—The Suburban Flying Club, with headquarters at Unger Airport, WESTFIELD, has been formed at MAPLEWOOD. Officers: Gene Harrison, president; James Pinkerton, vice-president; Stewart Ross, treasurer. . . . Silvio Cavalier, pilot for the Reich Air Service at ATLANTIC CITY Airport, has found that towing a banner behind his plane advertising rides has brought results.

● NEW YORK — Donald Woodward Airport, LEROY, was scheduled to open early in May with an air show featuring parachute jumps and stunt flying. . . . Contract has been let for recon-

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Designed by a pioneer with more than 27 years experience in aeronautical engineering.

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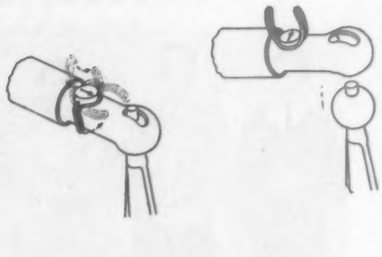
BLOCTUBE ENGINE CONTROLS (right)

Universal ball joints—safety locking device—elimination of backlash—rapid dismantling without tools—used on Handley Page, Vickers, Renault and other airplanes.



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Historical

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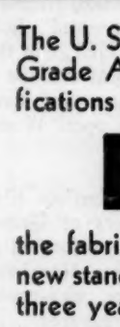

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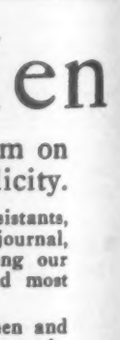

No. 12 Bartow Beacon

The U. S. Army Corps' first official purchase of Grade A airplane fabric under the new specifications for weight and sizing was

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the fabric that had been conforming to these new standards since it was first produced, nearly three years ago.

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ditioning and regrading of the Department of Commerce intermediate field at NEW HACKENSACK. . . . Beckwith Havens and Richard H. Depew, Jr., Roosevelt Field, MINEOLA, report the sale of five new Fairchild 24s in four days. . . . The WPA has released $80,000 for improvements at Harris Field, ELMIRA. Plans call for a large office building, grading of the 2,000x100 ft. glider runway, erection of a glider hangar and five cabins for the accommodation of visiting glider pilots. . . . Leech Aircraft, Inc., ARMONK, have purchased a Ranger powered Fairchild 24. . . . Ford Williams is now associated with George McCauley in Aeronautical Radio Company, Roosevelt Field, MINEOLA. The company is distributor for R.C.A. and Western Electric radio equipment.

● NORTH CAROLINA — The Carolina Aero Club held a meeting and air show at KINSTON Airport early in May. 44 planes were on hand. . . . Maj. Al Williams and his Gulfhawk were the stars of an air show and model contest sponsored by the RALEIGH *News & Observer* late in May. . . . The GREENSBORO Chamber of Commerce is laying plans for the dedication of Lindley Field after completion of the WPA improvement project.

● OHIO — General Airmotive Corporation, CLEVELAND Municipal Airport, has been designated an approved aircraft engine overhaul station by the Bureau of Air Commerce. The company, headquartered in the old American Airways hangar, is sales and service agent for Wright, Lycoming, and Menasco engines, Scintilla magnetos, Stromberg carburetors, Eclipse starters, and B.G. plugs. . . . The WARREN and YOUNGSTOWN Chambers of Commerce are formulating plans for a 1,000 acre jointly owned airport at VIENNA. . . . An air show sponsored by the CINCINNATI *Post* drew 25,000 spectators to Lunken Field late in May. . . . The Independent Airport Operators Association has been formed at CLEVELAND Municipal Airport by the owners of private hangars at the field. Officers: J. W. Borton, president; Roger Burgess, secretary, and Don Patrick, treasurer.

● OKLAHOMA — The OKLAHOMA CITY Aviation Club and the TULSA Airmen's Club sponsored the Oklahoma State Air Tour, scheduled for June 11-12-13. The itinerary included 22 cities, and was expected to draw about 40 planes. . . . The Brown-Young Aircraft Company has leased the old TWA hangar at TULSA Municipal Airport.

● OREGON — The WPA is spending $12,800 for the installation of air markers in more than 150 towns in OREGON. . . . The Private Flyers Association of EUGENE was to be host to the Sportsman Pilots Association of PORTLAND late in May.

● PENNSYLVANIA—At an airshow at LANCASTER Airport late in May, Buddy Batzel made a delayed parachute jump from 12,000 ft. . . . The WPA will spend $105,000 on an improvement project at Worley Field, WAYNESBURG. Plans call for grading and draining, and construction of three runways from 2,600 to 3,250 ft. long. . . . Al Leeward, manager of VANDERGRIFT Airport, has bought a tri-motored Stinson for passenger flying. The Leeward Flying Service has been appointed distributor for Aeronca planes.

● RHODE ISLAND—More than 100,000 persons were on hand May 30 and 31 for the re-opening and re-dedication of the renovated State Airport at HILLSGROVE. The dedication was in conjunction with Rhode Island's Tercentenary, and the program included a wide variety of exhibition and stunt flying and parachute jumping, including flying exhibitions by Col. Roscoe Turner.

● SOUTH CAROLINA — A $90,000 WPA project at FLORENCE will provide the airport with a new hangar and concrete runways. . . . Seven airports in the State are being constructed or improved, and twenty others are pending, under the WPA airport improvement program. . . . Grading work at GREENVILLE Airport is about half finished, with about 150,000 cu.yd. of earth being moved.

● TENNESSEE—The Air Aces gave a two hour show at Lovell Field, CHATTANOOGA, early in May. 6,000 spectators turned out for the event.

● TEXAS — BIG SPRING voters have authorized a $42,000 warrant issue for the purchase of an airport site. $6,000 of this total would be used as sponsor's contribution to obtain an allocation from the WPA for improvement work. . . . LUFKIN has voted to buy a 120 acre airport site for $75 per acre.

● UTAH—Wynn B. Ferrin, manager and instructor of the Aircraft Flying Service, OGDEN Municipal Airport, announces that the company has bought two additional planes: a Taylor Cub for student instruction and a four-place cabin ship for charter work. Ferrin's assistant at the field is John Pack.

● VERMONT — The Bureau of Air Commerce is considering establishment of a radio range beacon at BURLINGTON. . . . The airport at MORRISVILLE was dedicated early in June.

● VIRGINIA—Horace P. Grim, Jr., is seeking permission from the city of STAUNTON to conduct a flying school and do charter work from the municipal airport. . . . The WPA has allotted an additional $15,230 for clearing, excavating, grading, seeding and landscaping at Preston Glenn Municipal Airport, LYNCHBURG.

● WASHINGTON — Traffic control lights are to be installed at Boeing Field, SEATTLE, at a cost of from $1,000 to $1,500. . . . A Northwest Aviation Planning Council was held in SPOKANE May 28 and 29 to discuss the aviation problems of the northwest.

Schools

● The BOEING SCHOOL OF AERONAUTICS, Oakland Municipal Airport, Oakland, Cal., has announced a new Airline Dispatching and Meteorological course. It will require 624 hours of lectures, and 672 hours of laboratory work. Only aeronautical or mechanical engineering graduates of an accredited engineering college are eligible.

● The CASEY JONES SCHOOL OF AERONAUTICS, Newark, New Jersey, has placed 72 graduates in jobs in the industry since the first of the year.

● PARKS AIR COLLEGE, East St. Louis, Illinois, has announced it is negotiating for the purchase of a twin-engined plane for student instruction.

● The JESSE JONES AIR SERVICE, Lancaster Municipal Airport, Lancaster, Pa., announces the enrollment of nine new students. . . . More than 100 students of the WARREN SCHOOL OF AERONAUTICS, Los Angeles, Cal., have gotten jobs in the industry in the last few weeks. . . . Floyd Wright has been made chief instructor at the Eddie Martin Airport, Santa Ana, Cal. He has started the FLOYD WRIGHT FLYING SERVICE, and has 60 students enrolled, taking instruction in an Aeronca and a Stinson. . . . Whitney Gregg, manager of INTER-CITY FLYING SERVICE, Fort Wayne, Ind., has bought a two-place Rearwin Sportster. . . . The RISING SUN AIRCRAFT SCHOOL, Philadelphia, Pa., will give a series of Saturday radio broadcasts, interviewing prominent people in the aviation industry. . . . WALDEMAR HAGBERG has established a flying school at the new Valley Airport, Palmer, Mass. . . . John H. Shobe, of SHOBE AIRLINES, East Boston Airport, Mass., reports twenty new students have enrolled. Alfred R. Leckscheid is in charge of student instruction. . . . LOUISIANA STATE UNIVERSITY has purchased a new Fairchild 24, which will be based at the University's field, New Orleans. . . . GAGES FLYING SERVICE has opened a flying field 4½ miles west of Mansfield, Ohio. Glen Gages will be in charge of student instruction and charter work.

● THE NEW "CUB" IS SAFE ● ECONOMICAL ● STURDY ● STABLE ●

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When you FLY the *New* "CUB"

PAY ONLY **$490** CASH *and* Fly it home.

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THE New CUB makes EVERYBODY a prospect for flying instruction and sight-seeing hops because of the startlingly low operating cost. Old men of 60 and youngsters of 10 fly the CUB. Students quickly learn to fly then build up flying time at a big profit to you. One man earned $300 the first month; another $1,115 the first 3 months. Cub operators the world over tell the same story—the CUB is a revelation in flying economy and busy most of the time.

The New CUB is sturdy and tough; built to take the punishment of beginners. Upkeep is negligible. So when it comes to breaking records don't overlook that little detail of PROFITS. Fly with the New CUB and "ring the bell" day after day . . . on the cash register.

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Weems Department of Commerce Type Aircraft Plotters
Weems Second Setting Navigation Watches
Bureau of Standards Type Aircraft Sextant
Navigation Note Book and Plotter (new)

HOME STUDY COURSES IN AIR NAVIGATION:
Elementary Course
Advanced Course

RESIDENCE COURSE IN AIR NAVIGATION:
Ryan School of Aeronautics, San Diego, Calif.
Weems Navigation School, Annapolis, Md.
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Send for folder giving further details, price list of books, instruments and instructions.

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FLY to your rendezvous with health and sunshine. Choose the beach you like best, and within the hour feel the tang of sparkling water. Select your mountain lake, and enjoy its pine-scented stillness before appetite clamors for another meal.

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Searchlight Section

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Aviation People

Who's who and what they are doing

• Twenty awards of the Collier Trophy have been made by the National Aeronautic Association since its donation by Robert J. Collier in 1911. This year marks the first time it has gone to the manufacturer of a transport plane,—DONALD W. DOUGLAS. The committee's citation stated "Donald W. Douglas, for the development of the outstanding twin-engined commercial transport plane. In making this award, recognition is given to the technical and production personnel of the Douglas organization." Mr. Douglas, president of Douglas Aircraft Company, is a past president of the Institute of the Aeronautical Sciences, a member of the Board of Governors of the Aeronautical Chamber of Commerce, and in May, 1935, went abroad to deliver the Wright Memorial Lecture before a meeting of the Royal Aeronautical Society in London.

• L. B. MANNING has retired from the presidency of Cord Corporation to be succeeded by E. L. CORD. The latter's post as chairman of the board of Aviation Corporation is henceforth to be occupied by Mr. Manning, who is also president of the Aviation Corporation. H. T. AMES was elected vice-president and director of Cord Corporation, with L. K. Grant as treasurer. HAROLD KONDOLF was elected vice-president and secretary of Aviation Corporation. Mr. Manning stated that his major attention will be given to the affairs of Aviation Corporation, although his financial interest in Cord Corporation is retained.

• MERVYN A. GARROLD, former toolmaker for Curtiss Aeroplane & Motor Company and more recently in the fuselage department of the Lawrence W. Bell Aircraft Company, is enroute to China to assist Intercontinent Airplane Corporation (foreign associate of the Curtiss company) in producing a rush order of planes. Some years ago Mr. Garrold supervised the building of twenty planes for the Turkish government.

• December, 1935, MAJOR GENERAL OSCAR WESTOVER, Chief of the Air Corps, named BRIG. GENERAL FRANK M. ANDREWS to the temporary rank of major general. General Andrews has been in command of G.H.Q. Air Force at Langley Field, and upon confirmation of his appointment by the Senate will be reassigned to this post. Under the new law the following promotions to the rank of Brigadier General will also be in line: COL. HENRY C. PRATT, Langley Field, now commanding the second wing, G.H.Q. Air Force; COL. GERALD C. BRANT, Barksdale Field, La., commanding the third wing, G.H.Q. Air Force; COL. BARTON K. YOUNT, Army War College, Washington; LT. COL. DELOS C. EMMONS, Fort Shafter, Hawaii, in command of the 18th composite wing of the Air Corps; LT. COL. GEORGE H. BRETT, now a student at the Army War College, Washington. The five latter will be assigned to command of the three wings of the G.H.Q. Air Force and the two composite wings in Hawaii and the Panama Canal Zone.

Col. John H. Jouett

L. B. Manning

Donald W. Douglas

• The public relations department of TWA has been shifted from New York City to Kansas City with R. S. KNOWLSON, formerly Manager of Public Relations made Director of Public Relations. The department has been broken down into four divisions: Mr. Knowlson for the western area, with headquarters at Kansas City; MILTON VAN SLYCK, Manager of Public Relations for the central area, with headquarters at Chicago; CLANCY DAYHOFF, Manager of Public Relations for the Pacific Coast area, with headquarters at Los Angeles; and HARRIS HULL, Manager of Public Relations for the eastern area, with headquarters at New York City. Mr. Hull, the only newcomer, was previously connected with the aviation department of the Washington *Post*.

• SHERMAN M. FAIRCHILD, president of Fairchild Aviation Corporation, has announced the appointment of COL. JOHN H. JOUETT, formerly of the U. S. Army Air Corps, as president of Fairchild Aircraft Corporation at Hagerstown, Md. Col. Jouett's aeronautical career dates from 1916 when he entered the aviation section of the Signal Corps. Upon his resignation from the Army in 1930 he took charge of aviation development for Standard Oil Company of Louisiana. At the invitation of the Chinese government he organized the Chinese air forces and established a military flying school, returning to the United States in 1935.

• REAR ADMIRAL ERNEST J. KING, since May, 1933 Chief of the Bureau of Aeronautics, Navy Department, has succeeded REAR ADMIRAL HORNE, as Commander, Aircraft, Base Force, at San Diego. Admiral King was in command of the USS "Wright" and seaplane squadrons from 1926 to 1928, later was appointed Commander, Aircraft Squadrons, Scouting Fleet, and until 1932 commanded the USS "Lexington."

• REAR ADMIRAL FREDERICK J. HORNE, for the last year commander of aircraft, Base Force, has relieved VICE ADMIRAL HENRY V. BUTLER as commander of aircraft, Battle Force. He will automatically be promoted to Vice Admiral and will command the fleet air forces for the next two years. Admiral Butler takes over command of the 6th, 7th, and 8th naval districts and the Charleston navy yard. Both officers have long and distinguished Navy records. Admiral Horne commanded the aircraft tender "Wright," the "Saratoga," and later Train Squadron 1, Base Force. Admiral Butler was the first naval officer to be given the rank of vice admiral in command of aircraft forces, commanding aircraft squadrons, Pacific Fleet, and aircraft squadrons, Battle Force.

• LEIGHTON W. ROGERS, president of the Aeronautical Chamber of Commerce, announced the appointment of W. C. Clayton as engineer for the Chamber. He will coordinate the engineering ideas of the industry for presentation to the

Bureau of Air Commerce in connection with its airworthiness specifications. The technical departments of the manufacturers will cooperate through the Engineering Committee. From 1917 to 1927 Mr. Clayton was associated with the Boeing Airplane Company, then joining the airplane division of Ford Motor Company. He was engineer with Atlantic Aircraft Corporation at Hasbrouck Heights, N. J., building Fokkers; in 1928 became assistant chief engineer of Metal Aircraft Corporation of Cincinnati, later serving in similar capacity for Pitcairn Autogiro Company. Prior to his new appointment he was engineer in the Bureau of Air Commerce.

• At the close of the college term, PROFESSOR FRED D. FAGG, JR., director of the Air Law Institute of Northwestern University, will make his headquarters in Washington to undertake the revamping of the Department of Commerce aircraft regulations. Prof. Fagg was appointed to the task by the Bureau of Air Commerce and will devote the summer to its execution. He acted as legal adviser to the Federal Aviation Commission when that body prepared its report in February, 1935.

•Aviation people visiting this country from abroad: DR. J. ROBINSON, British inventor of many radio devices, formerly with R.A.F. Here on patent matters, also to look over latest in airline communications . . . COMMANDER MANUEL DE LA SIERRA, in New York while completing his sea duty on the Spanish school ship *Juan Sebastian Elcano*. In service with the Spanish navy, Commander de la Sierra has been in charge of the Naval Aviation School at Barcelona, also served on the board which recommends equipment for Spanish naval aviation. WING COMMANDER L. J. WACKETT of the Royal Australian Air Force (Res.), and SQUADRON LEADERS HARRISON and MURPHY, comprising a special commission investigating civil and military aviation equipment, visited the United States following a several weeks tour of the aviation industry in Europe. . . . DR. ING. HEINRICH HERTEL, technical director of Heinkel-Flugzeugwerke, and ING. ERICH KLEINEMEYER of the Heinkel Engineering staff, making a trip through the States to visit important factories and to study metal airplane production. . . . COMMANDER FILIPPO SCHIAFFINO, managing director of Piaggio & Company of Italy, producers of aircraft motors . . . CHARLES DOLFUSS, co-editor of L'Histoire L'Aeronautique, made the round trip on the Hindenburg in June, "just for the ride" . . . OTTO J. MERKEL, Director of Weser Flugzeugbau and one of the organizers and former director of Lufthansa paid a ten-day visit. . . . SQUADRON COMMANDER JAMES BIRD, director of Supermarine Aviation Works and Vickers of England, also on a brief visit.

Side Slips

By Robert R. Osborn

MRS. HARRIET HAGUE, 86-year-old passenger on the first eastward flight of the dirigible Hindenburg, returns home reporting the trip to be very pleasant but too quiet and peaceful to be thrilling. The *Herald Tribune* quotes her: "No one has any secrets aboard a dirigible. The engines make no noise and there is absolute stillness in the cabin. The partitions are not sound-proofed and everything that is said in the passenger quarters can be heard distinctly."

This certainly is a serious complaint and should be remedied by the Zeppelin

Company. They should at least soundproof the smoking room for the traveling salesmen.

AS AN Associated Press dispatch informs us that the French are following the lead of the Russians in developing companies of soldiers who will jump by parachute behind the enemy lines. "The jumpers, enlisted for five-year periods, will be paid the unusual salary of 2,000 francs, or $120 a month. The ordinary soldier gets 6 cents a day plus some tobacco and wine."

We wouldn't be interested even if they offered us 2,000 francs *and* the tobacco and wine.

RADIO SINGER SOLOS IN 3½ HOURS. — *Herald Tribune* headline.

From listening to some of them we had the impression they had even less training than that.

WE SEE by the papers that an expert trapper is being flown around the Alaskan countryside in an attempt to kill off the great numbers of wolves. These wolves are destroying so many of the native reindeer that the Eskimos are without food except that provided by the government.

You'll probably be glad to learn that at least the wolves of this country are not on relief.

THE Bureau of Entomology and Plant Quarantine in Washington has recently purchased an autogiro to be used in "bug chasing." The recent success of the Autogiro Company in eliminating some of the "bugs" from their designs indicate that the machine should be very successful in this service.

AT the recent meeting of the Society of Automotive Engineers at White Sulphur Springs one of the speakers stated that the car of the future "will not run on the highway alone. It must fly at the will of the driver or when special speed is required; it must take to the water at the seaside or the inland lakes."

This will probably result in the extinction of the Genus Homo Pedestrian. He won't be able to get away from the wild driver even by climbing a tree or jumping off the dock.

A NEW YORK State man, who just passed his 100th birthday, recently took his first airplane ride and liked it. He was born in a log cabin on the same ground on which his house now stands. Always lived in the same place and has been away from home only one night in his life. He is a bachelor and has never used tobacco or liquor. He says he has no formula for a long life.

However, he has the right formula for making any length of life seem long.

A REPORT of United Airlines states that, in proportion to size, Reno, Nevada, leads the whole nation in patronage of air travel. The business seems to be nearly evenly divided between couples wishing to take advantage of the moderate marriage laws, and married people equally anxious to untie the knot under

the easy divorce regulations. Thus the advances of aviation would seem to give the institution of marriage an even break, allowing couples to get into it, and out of it, faster.

INDIAN medicine men of Eastern Panama are now carving wooden models of airplanes to use as charms to cure the ills and misfortunes of their patients. We are anxious to hear if the system has been successful. We know a number of designers who would like to try the same scheme for getting rid of the "bugs" in their airplanes.

Presenting

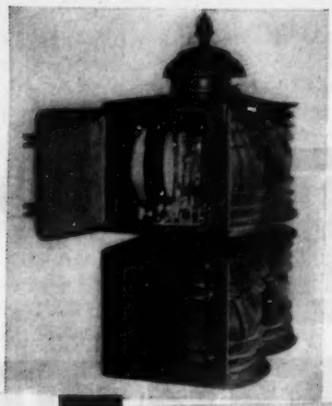
AIRPORT EQUIPMENT

Lighting · heating · emergency · radio · · hangars · fencing · trucks and tractors

AVIATION'S

SUPPLEMENT FOR JULY 1936

LIGHTING



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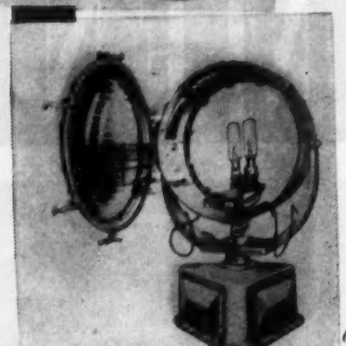

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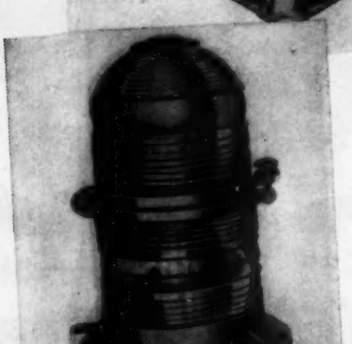

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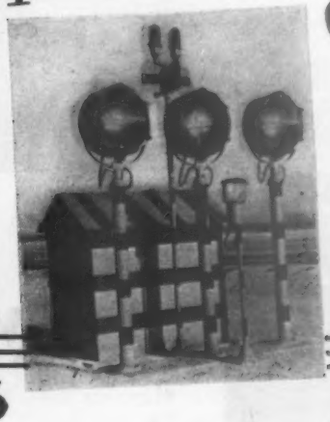

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OF the various combinations of lighting equipment for airports there is practically no end. Each field represents a totally different problem. Each field manager has his own ideas as to how best the problem can be met. The results are sometimes confusing, and more often irritating, to the pilot who must land at half a dozen different airports in the course of one night. Some effort at standardization is now being studied by the Bureau of Air Commerce and the Bureau of Standards, but it will probably be a long while before anything like similar conditions prevail at airports throughout the country.

Take, for example, the problem of floodlighting. Some fields are illuminated by one or more high intensity units placed at appropriate locations. Here an effort is made to concentrate enough light in one unit to cover the entire landing area. Other fields distribute the light sources, placing smaller single units or banks of units at strategic points about the rim of the field. Where single units are used, to prevent undue glare in the pilot's eyes, a movable shadow bar should be provided under the control of someone on the ground. Thus, no matter from which angle approach to the field is made, the pilot is protected against direct and blinding glare. Where batteries of smaller lights are used, they cannot, of course, be equipped with shadow bars, but they are usually so placed that landings are made over the lights, so at no time pilots need face them directly. Many pilots prefer to make night landings without floodlights turned on, coming in between the boundary lights with the aid of their own landing lights.

Apart from the main landing area, smaller types of floodlights, usually pole or bracket mounted, are used to illuminate loading platforms, fueling pits, and so forth. Also batteries of smaller floodlights are used to illuminate the exteriors of hangars, terminal buildings or high obstructions immediately surrounding the field.

There is an increasing tendency to outline runways with flush type lights set into the ground. There are a number of forms, but they usually consist of single lighting units in suitable shells set into concrete along the edges of the runway. The lenses are reinforced and made heavy enough so that a wheel of an airplane may run over them without doing any damage. Another type of runway lighting that has been proposed, but as far as we know, never extensively installed, consists of placing long Neon tubes in shallow trenches along the edges of runways. The trenches would be covered with heavy glass slabs strong enough to withstand the weight of any airplane which might run across them. Different color combinations may be installed in flush type lighting of all types to indicate to the approaching pilot just which runway to use.

Field boundary lights are commonly mounted on brightly painted metal cones, visible in the daylight. They are usually made to rest on the surface of the ground with detachable electrical connections so that if they happen to be struck by a landing airplane, they are simply knocked out of the way without doing any damage to the

EQUIPMENT

ship. They may be permanently connected to the power supply through underground cables or conduit, or they may be independent units with power to the lights supplied from a storage battery in the base cone.

Obstruction lighting constitutes no great problem. The lights and fixtures are those usually used for outdoor industrial lighting. Each light is usually encased in a weatherproof housing. Ordinary conduit is used for mounting.

Most airports are equipped with a standard airway type rotating beacon mounted on a suitable steel tower usually surmounted by a stationary flashing code type beacon to give the pilots an identification mark for the airport. Rotating beacons may be of the single-lens type rotating at 6 r.p.m. or they may be of the double type rotating at 3 r.p.m. but giving six flashes per minute. They are usually fitted with 1,000-watt lamps operating on either 30 or 110-volt current. Usually, equipment includes an automatic lamp changer which throws a spare bulb onto the circuit and into focus automatically if the original burns out. Most recent type of beacon is that designed by J. B. Bartow which combines the advantages of high candlepower of the projector type with the wide angle visibility of the flasher type. It is spherical in form and is provided with three systems of lenses which throw three light beams, two in approximately the horizontal plane and one vertically. Some of the advantages include: wide vertical range; long duration flash; easy identification from surrounding lights.

Another type of projector used for airports is the ceiling indicator, a beacon which throws a spot of light on overhanging clouds. By sighting on the light spot with an alidade, and knowing the angle of projection of the light beam, the altitude of the clouds above the airport may be computed.

Various forms of lighted wind indicators are available. If a simple wind sock is used, it may be floodlighted by small lights placed above it or actually inside the cone. More elaborate is the illuminated wind tee, usually placed at one corner of the airport. Wind tees may be illuminated by floodlight or by a row of lamps on the tee itself. One form has a paddle type velocity gage incorporated which gives indication of the wind velocity to the approaching pilot by lighting various combinations in colored lamps on the tee. (See page 26)

Of the many types of cable for wiring around the airport, those designed for installation directly in the earth holds particular interest for the airport constructor and operator. Several varieties are available and their essential differences lie in their armor, which may be non-metallic, metallic (steel or lead sheathed) or synthetic rubber sheathed. Cable accessories include junction boxes, terminals, splicing materials, etc. Welding cable and rubber covered building wires of the braided or lead-covered variety are also used extensively.

Various types of control have been worked out for airport landing and other lights. In the most advanced forms, all controls are operated from a desk in the control tower. Push-buttons or small hand switches control any combination of lights on the field. A miniature layout of the airport with small lamps mounted to represent larger counterparts indicates to the operator just what circuits are active at all times. An example is shown in the picture below.

Lights and Accessories

Air Associates, Roosevelt Field, L. I., N. Y.
American Airport Equipment Company, 5958-60 Washington Blvd., Chicago, Ill.
American Cable Company, 230 Park Avenue, New York, N. Y.
American Gas Accumulator, Elizabeth, N. J. (1)
Anaconda Wire & Cable Company, 25 Broadway, New York, N. Y.
Air-Ways Equipment Corporation, Milwaukee, Wis.
Bartow Beacons, Inc., 1605 Walnut Street, Philadelphia, Pa.
Bull-Dog Electric Products Company, Jos. Campau Avenue, Detroit, Mich.
Crouse-Hinds Company, Syracuse, N. Y. (2)
Cutler Hammer Company, Twelfth and St. Paul, Milwaukee, Wis.
General Cable Corporation, 420 Lexington Avenue, New York, N. Y.
General Electric Company, Schenectady, N. Y. (3), (4), (7)
Hazard Insulated Wire Works, Passaic, N. J.
Kellogg Switchboard & Supply, 1066 West Adams, Chicago, Ill.
Kerite Insulated Wire & Cable Company, 30 Church St., New York, N. Y.
Lakewood Engineering Company, Columbus, Ohio (9)
National Carbide Sales Corporation, Lincoln Building, New York, N. Y.
Nicholas-Beazley Airplane Company, Inc., Marshall, Mo.
Claude Neon Lights, Inc., 41 East 42d Street, New York, N. Y.
The Pyle-National Company, North Kostner Avenue, Chicago, Ill. (5)
John A. Roebling's Sons Company, 640 S. Broad St., Trenton, N. J.
Rose Aviation Corporation, 45 West 45th Street, New York, N. Y.
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. (6), (8), (10)

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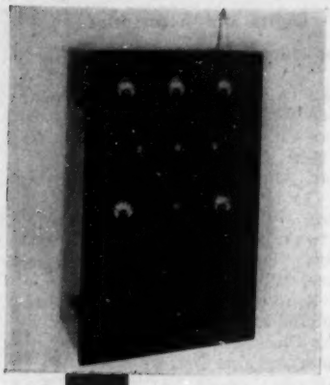
RADIO



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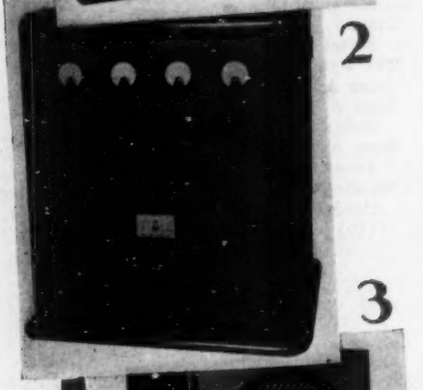

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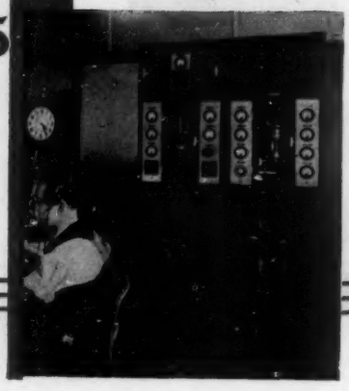

IF, AS far as safety is concerned, there is any one element in the present-day air transport picture that is more important than any other, it is proper communication between the ground and aircraft in the air. Even in the best of weather, the maintenance of contact with ships in the air is highly important. When the weather closes in it is absolutely essential.

Contact with aircraft in the air is becoming more and more important, especially in the vicinity of airports, as the airways become more crowded. This fact has given rise to the development of relatively short range transmitting sets designed for control of arrivals and departures. There are, therefore, two general types of airport radio equipment offered today for two distinctly different purposes. The first is for long-range ship-to-ground or point-to-point communication. Typical of equipment of this sort is Western Electric's 400-watt transmitter (14-B) which will deliver 400 watts of carrier power at frequencies of 2 to 12 megacycles, and 300 watts at 12 to 18.1 megacycles. This unit has ten crystal stabilized frequencies available, anyone of which may be selected by operating a standard telephone selector dial. This unit is arranged for remote control.

RCA puts up a unit for similar purpose, the Model AVT-4 airport communication transmitter with an output of 125 watts on any three crystal controlled pre-selected frequencies within the band covering 2,000 and 6,500 kilocycles. Three types of emission may be used, CW telegraph, MCW telegraph, or telephone. The unit operates from 110-volt a.c. single-phase power. A similar unit, with the three frequencies but with 25 watt output is also available.

For traffic control purposes within short range of the airport, specially designed transmitters are available. RCA's Model AVT-1A (crystal controlled on any pre-selected frequency between 200 and 410 kilocycles), and Western Electric's Model 10-A transmitter (10 watts output, crystal controlled, frequency range 230 to 500 kc.) are typical. The Harvey 200-F transmitter (with eight pretuned frequencies from 1.5 to 7 megacycles) is another example.

As companion pieces to the transmitting equipment detailed, the companies listed manufacture receivers which are suitable for long or short-range contact with ships in the air and for point-to-point work. The RCA general purpose receiver model AVR5A illustrated (4) provides five distinct bands between 150 and 18,000 kc. It employs a 9-tube superheterodyne circuit and operates on 100 or 220 volts 60-cycle single-phase AC. It has a maximum output of ten watts, undistorted output, six watts. It is built especially to withstand the heat and dampness of tropical climates. An 8-inch loud speaker is built in.

Western Electric's receiving equipment (models 11A and 11B) are designed especially for airport use. The 11A is continuously tunable over a frequency range from 2,700 to 6,500 kc. The 11B has two fixed pre-tuned and pre-selected crystal controlled frequencies. Both sets are mounted in self-supporting cabinets and use separate loud speakers.

A wide range of remote controls, special microphone arrangements, etc., are also available. Certain of the manufacturers listed do not offer airport radio equipment out of stock items, but are prepared to fill special requirements on order.

●

Radio

General Electric Company, Schenectady, N. Y.
Harvey Radio Laboratories, 12 Boylston Street, Boston, Mass.
Lear Developments, Inc., New York, N. Y.
RCA Manufacturing Company, Inc., Camden, N. J. (2), (3), (4)
Seabury & Sons, Inc., Boonton, N. J.
Western Electric Company, 195 Broadway, New York City. (1), (5)
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Day

Western Electric Radio Telephone flies with American Airlines

Again Western Electric is the choice—this time for American Airlines' new fleet of DST Douglas sleepers. A natural choice, too—for Western Electric 2-way radio has served American Airlines faithfully for over six years!

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Western Electric

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You can get Texaco Aviation Gasoline in the proper octane rating for your engine.

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at high temperatures. They are free from harmful gum and carbon forming elements because they are refined by special processes which give them greater purity and stability.

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Products

THE TEXAS COMPANY
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HANGAR

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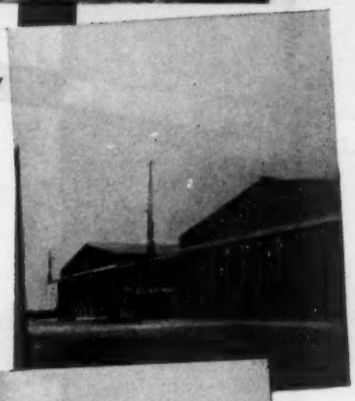

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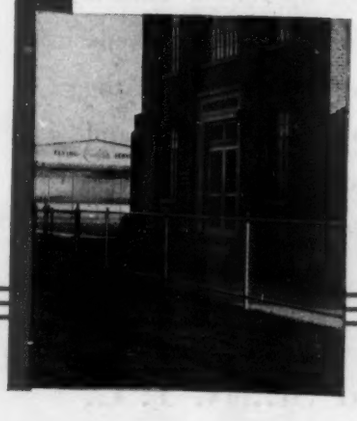

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THE real problem in the building of hangars is only recently coming into evidence. Heretofore the wing spans of most of our aircraft have been such that there has been no particular difficulty about obtaining structural steel buildings of ordinary industrial types to house them. Exceptions, of course, have been the very large hangars built at Akron and at Sunnyvale to take care of large rigid airships. Recently, however, designers are beginning to think in terms of wing spans far and away in excess of present dimensions. As suggested elsewhere in this issue, we may come to the point where exceptionally large ships must be secured out of doors and never go under cover, simply because it will be impracticable to provide hangars with sufficient clear span to take care of them. As an indication of the trend, Douglas has been forced to build a hanger with a clear span of 250 ft. This should take care of aircraft for some time to come but obviously the construction of such buildings is very expensive.

For housing smaller airplanes there has been a revival of interest in individual hangars. Taylor Aircraft at Bradford, and a number of the Aviation country clubs have gone in for this type. A few wooden hangars with wood roof trusses of relatively short spans are still being built, but modern hangar specifications call for brick and steel with concrete floors, adequately lighted and with good fire protection.

A number of companies (see list) have been specializing in more or less standardized building units for hangar use. Specifications are generally similar to those written for ordinary industrial housing. Primary requirement, of course, is large door opening. Desirable also is plenty of window sash area. Considerable use has been made of hangar construction of so-called "protected" metals. Ordinary corrugated iron sheets require considerable maintenance and constant painting, but the protected metals, although higher in first cost, show savings in maintenance. The H. H. Robertson Company specializes in this particular type of building material.

For wide, clear spans, doors are always a problem. Several types are in use, perhaps the most popular being the rolling type in which relatively short individual panels are mounted on rollers and tracks, and may be pushed back out of the way against the side walls, section by section. Other types of doors in common use include the canopy style which swings upward and outward as a unit, or the vertical lifting type, similar to garage doors.

Hangar heating is often a difficult problem because of the large cubic content of hangars, and also because doors must be opened to their full extent frequently. For this reason, unit heaters with blower attachment seem to be well adapted for hangar use. They give positive circulation of heated air and prevent the thermal stratification that occurs when heating by radiator only, where the hot air rises and stays close under the roof and the cold air flows across the floor just where mechanics are working. Various types of unit heaters are available, some for floor mounting, others designed for suspension along walls or

EQUIPMENT

in roof trusses. These forced circulation heaters are often useful for solving special problems, such as keeping engines warm, etc. By attaching suitable canvas or flexible ducts to the heater a stream of warm air can be placed wherever required. In summer time unit heaters may give some cooling effect by circulating city water.

The problem of a boiler for the heating system is too broad to be discussed here. There are no special features that distinguish a hangar heating boiler from any other industrial heating type.

Good lighting is essential for accurate work. Some operators prefer lighting from side walls by means of small flood lights, two examples of which appear on this page. Side wall flood lighting has the advantage, of course, that light is thrown under the wings of planes standing on the floor, whereas if lighting is overhead, shadows are cast unless special attention is paid to selection of reflectors, etc. The Cooper Hewitt tubular type of overhead lamp is well adapted to hangar use.

As it is seldom possible to get enough cencentrated lights from fixed installations on special jobs, every hangar should be provided with plenty of electrical outlets, both along the wall and in the floor, for the attachment of portable flood, spot, or trouble lighting equipment. Incidentally, too, it is a good idea to install grounding connections at frequent intervals in the hangar floor so that ships may be electrically grounded while they are being serviced or stored.

For the safety of field personnel or visitors, adequate fencing is necessary around hangars and field boundaries. A number of the concerns listed have made a special study of airport requirements and are in a position to furnish woven wire and other types of fence for the airports.

●

Buildings

Allith-Prouty Mfg. Company, Danville, Ill. (1)
Austin Company, Cleveland, Ohio. (4)
Blaw-Knox Company, 652 Farmers Bank Building, Pittsburgh, Pa.
Cornell Iron Works, Inc., 30-20 13th St., Long Island City, N. Y.
International Stacey Corporation, Michigan and Buttles Avenues, Columbus, Ohio.
International Derrick & Equipment Company, 875 Michigan Ave., Columbus, Ohio.
Maryland Metal Building Company, Race and McComas Streets, Baltimore, Md.
H. H. Robertson Company, Grant Building, Pittsburgh, Pa. (2)
Truscon Steel Company, Youngstown, Ohio. (3)

Fences

American Steel and Wire Company, 208 S. La Salle St., Chicago, Ill.
Anchor Fence Post Company, Eastern Avenue, Baltimore, Md. (5)
Cyclone Fence Company, Foss Park Avenue, North Chicago (5)
Page Fence Company, Bridgeport, Conn.
Stewart Iron Works, Covington, Ky.

Heaters (6), (7), (8)

American Blower Corporation, 6000 Russell St., Detroit, Mich.
American Heating & Ventilating Company, Philadelphia, Pa.
American Radiator Company, 40 W. 40th St., New York, N. Y.
Buffalo Forge Company, Buffalo, N. Y.
Clarage Fan Company, 500 Fifth Ave., New York, N. Y.
Grinnell Bros., Inc., 239 Union Ave., Brooklyn, N. Y.
Ilg Electric Ventilating Company, 15 Park Row, New York, N. Y.
Modine Mfg. Company, 101 Park Ave., New York, N. Y.
Skinner Brothers Mfg. Company, Inc., 1488 South Vandeventer Ave., St. Louis, Mo.
B. F. Sturtevant Company, Hyde Park, Boston, Mass.
The Trane Company, 2nd and Cameron Ave., LaCrosse, Wis.
U. S. Radiator Corporation, 370 Lexington Ave., New York, N. Y.
Utica Radiator Corporation, 47-46 30th St., Long Island City, N. Y.
York Heating and Ventilating Corporation, Philadelphia, Pa.

Lights

Crouse-Hinds Company, Syracuse, N. Y.
General Electric Company, Schenectady, N. Y. (9)
The Pyle-National Company, North Kostner Ave., Chicago, Ill. (10)
Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Sprinkler Systems

Grinnell Bros., Inc., 239 Union Ave., Brooklyn, N. Y.
Viking Corporation, Hastings, Mich.

Air Compressors

American Engineering Company, Aramingo and Cumberland Sts., Phila., Pa.
The Brunner Mfg. Company, 1821 Broad St., Utica, N. Y.
The DeVilbiss Company, 300 Phillips Ave., Toledo, Ohio.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Ingersoll-Rand Company, Chicago, Ill.
Sullivan Machinery Company, Chicago, Ill.
The U. S. Air Compressor Company, 5300 Howard Ave., Cleveland, O.

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There is a correct grade of Aero Mobi for every airplane engine make and mod for normal operating conditions and for tremes of heat and cold.

Use the Aero Mobiloil Chart as *your* g to correct lubrication. The colored band the can signals the correct oil for your

More than 250 leading airport dealer the United States are now displaying chart. They can supply you with the co grade of Aero Mobiloil for your engine. L for the Sign of the Flying Red Horse.

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The new Aero Mobiloil "Gra Band" is recommended fo small airplanes equipped wit low-horsepower engines—and for larger engines under u usually cold conditions. Aer Mobiloil "Gray Band" meet the requirements of all lead ing light engine manufactur ers—and those of the U. S. Army and the U. S. Navy. I is worthy of your confidence.

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FUEL HANDLING

THE PROBLEM of fueling airplanes has become far more complicated than it was in the old days when a funnel and a piece of chamois constituted the essential equipment. With airplanes traveling on schedule and speeds in the neighborhood of 200 miles an hour, profits are washed away in wasted ground time when gasoline is permitted to trickle into the tank. Not only revenue but human life is very likely to be lost when foreign matter, particularly water, finds its way into the fuel system of airplanes.

Many phases of the problem of keeping water out of airplane fuel are discussed in detail elsewhere in this issue (see page 18). In the space available here, we can only discuss briefly the general types of equipment used for the purpose. Airport fueling equipment falls generally into two categories—tank trucks and fuel pits. Each has certain advantages for particular types of service. Dispensing and metering equipment is essentially similar in both the portable and the permanently fixed systems.

Two general methods of dispensing fuel are now in use—the motor driven pump type and the hydraulic flotation system. In the pump type of unit the several types of equipment are generally similar except for the filtration method involved. One unit is fitted with a centrifugal filter installed on the discharge line as near to the pump as possible. This method has been very effective in the removal of water, moisture and dirt from fuel. Another type makes use of a filter-funnel especially designed for rapid delivery of gasoline and having a capacity of over 25 gal. a minute. A hand-operated fueling system for isolated airports where power is scarce or unavailable and fueling demands are not very great also is offered. This system is capable of delivering from 15 to 18 g.p.m.

A fuel pump with variable volume control has been developed recently. This arrangement eliminates power losses resulting from use of by-pass valves and reduces heat generation.

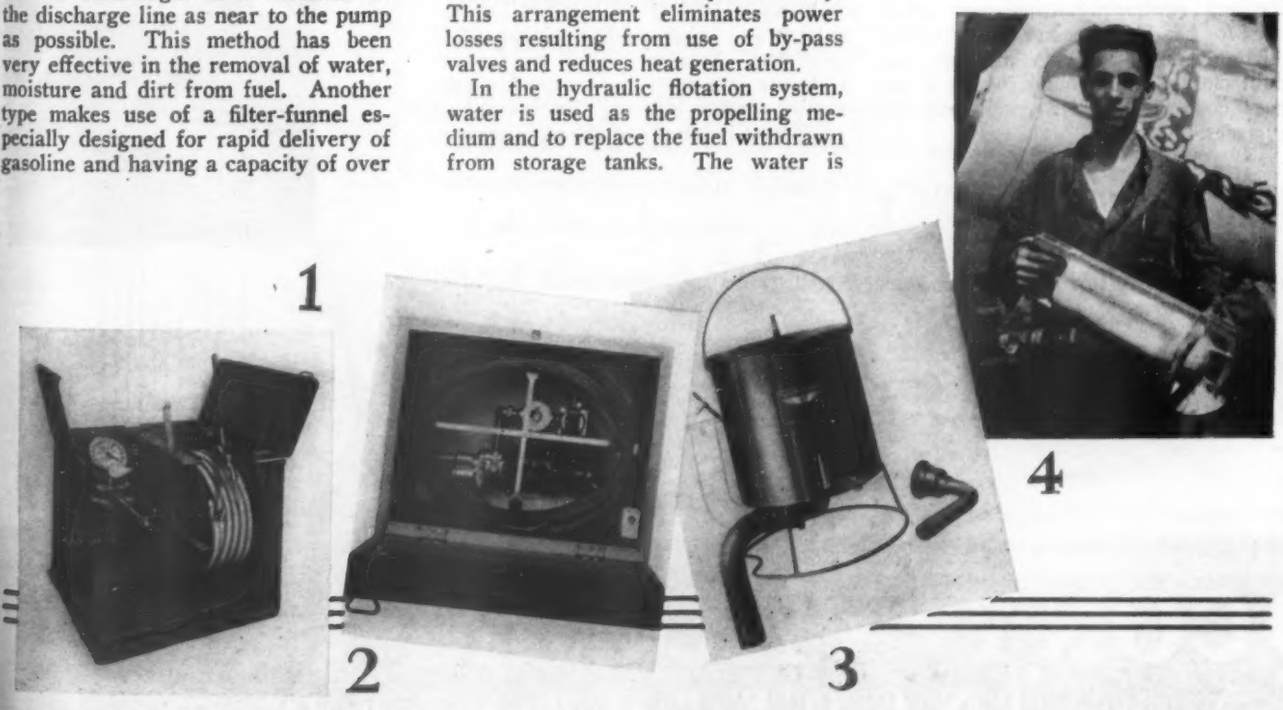
In the hydraulic flotation system, water is used as the propelling medium and to replace the fuel withdrawn from storage tanks. The water is admitted to the bottom of the storage tank and floats the gasoline out at the top. Thus no air comes in contact with the gasoline in storage, no vapor is discharged from the tanks while filling or at any other time, the tank cannot be exploded and will not be floated out of position by surface or ground water.

One of the most recently developed devices to keep foreign matter out of gasoline is a foot valve fitted with a float at its lower end which rises with the water level at the bottom of the tank and closes the suction line when the water level becomes dangerously high. This is the Veile valve manufactured by Swift of Elmira. It may be readily applied to the suction line of any stationary fuel storage tank or, with suitable goosenecks, may be installed in tank trucks. It is available in a number of sizes with delivery capacity up to 100 to 150 g.p.m.

An important part of every fueling system is the delivery hose. A number of the manufacturers listed produce reinforced gasoline hose both in real and in synthetic rubbers. The latter type of construction is becoming increasingly popular for airport use.

Fuel Systems and Accessories

Aqua Systems, Inc., 2443 Third Avenue, New York City.
S. F. Bowser & Company, Inc., Fort Wayne, Ind. (1)
Columbian Steel Tank Company, Kansas City, Mo.
Gilbert & Barker Manufacturing Company, Springfield, Mass. (2), (3)
B. F. Goodrich Rubber Company, Akron, Ohio.
The Liquidometer Corporation, 36-16 Skillman Ave., Long Island City, N. Y.
Motor Improvement, Inc., 365 Frelinghuysen Ave., Newark, N. J. (4)
Protecto Seal Company, 1906-24 South Western Avenue, Chicago.
Pump Engineering Service Company, Cleveland, Ohio.
Raybestos-Manhattan Company, Inc., Passaic, N. J.
Steel Products Engineering Company, Dakota Avenue and Columbia Street, Springfield, Ohio.
Swift Lubricator Company, Elmira, N. Y.
Yale & Towne Mfg. Company, Stamford, Conn.



TRACTORS

WHEN Pan American Airways established its mid-ocean bases at Manila, Midway, and Wake, one of the most essential elements of equipment was the tractor. But the usefulness of tractor equipment is not confined to isolated island airports. It spreads over a wide range of aeronautical activity and in fact everywhere that airport construction and maintenance is in progress. Besides the obvious uses of grading and preparation of field surfacing, tractor equipment is used extensively for handling airplanes, snow removal, and miscellaneous activities.

A number of varieties of tractor equipment are available, using diesel, gasoline, and electric power. The heavier tractors are of the general purpose variety for grading and general maintenance, while the lighter types find particular application in handling airplanes in congester quarters.

In the Maintenance Handbook section of AVIATION there has been illustrated from time to time a great variety of tail dollies and towing equipment used for this purpose. At some airports also, particularly where engine overhaul shops are remote from assembly hangars, the tractors prove very useful in towing engine assembly stands or other heavy pieces of machinery.

A good example of a tractor designed especially for a specific job is the Baker Raulang electric (4)which was developed for handling Boeing 247s in United Airline hangars. This machine was built close to the ground so that it can pass completely under wings and tail surfaces.

Tractors

The Baker-Raulang Company, Cleveland, Ohio. (4)
Caterpillar Tractor Company, Peoria, Ill. (3)
Clark Tructractor Company, Battle Creek, Mich.
Cleveland Tractor Company, Cleveland, Ohio. (1)
Klauer Mfg. Company, Dubuque, Iowa. (2)

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Other closely related airport machinery includes power units, cranes and trucks. In isolated locations, direct-connected generator sets are frequently used to supply current for field lights, radio communication, refrigeration and other electric power applications. Four diesel generator sets were purchased by Pan American for their ocean bases.

A new electric crane truck, recently developed, has been used extensively in airport work. This type of truck travels to its job whether it is in the hangar or at some remote point on the field and is capable of carrying repair parts, spare engines, or other necessary equipment. The hoist is so designed that quick and accurate alignment of engines with their mounting rings is possible and the crane can be furnished with towing loops for handling planes or swinging their tails for compass calibration.

A wide variety of graders, grass-cutters and other similar equipment is available. Another useful tractor attachment is a revolving broom for light snow or refuse clearing. Snow removal equipment is usually of the plow variety.

A newly developed machine, Snow-go (2), picks up the snow and discharges it in the form of a fine mist at the side of the runway. This equipment is in use at several airports where extremely severe weather is frequently experienced. The plow type, mentioned above, is in much more common use. Frequently, wing blades are used to increase the width of the path plowed. It is usually good technique to begin a winter's plowing with very wide cleared strips then, as successive snowfalls are plowed and the runway tends to get narrower and narrower the winter season will end with cleared strips still wide enough to be used safely. Another method consists of packing the snow down with heavy rollers instead of removing it from the runway. Thus, as the winter progresses, runway levels are raised higher and higher, ending up practically as strips of solid ice. The roller method, however, has not found widespread acceptance, and airports in the snow belt should consider some form of plowing equipment as essential.

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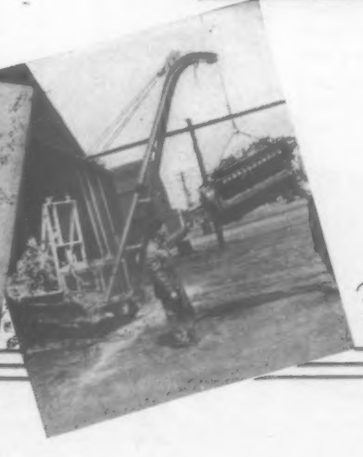

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"Just 20 Years Ago"

WITH its August issue, Aviation will have rounded out exactly twenty years of service to American aeronautics. The real significance of this anniversary, however, is that it marks the twentieth birthday of American aviation as a modern industry.

For it was in 1916 that the pioneering efforts of a small group of struggling manufacturers were first recognized by the United States Government with production orders for military planes.

The brilliant achievements of these early constructors laid the foundation for American aviation as it is today, and we can think of no more appropriate way of celebrating our own anniversary than by telling the story of the men and the companies who have contributed so much to the building of this modern industry.

Cooperating with us to make this two-fold anniversary noteworthy are many of the pioneers who themselves directly contributed to the record of progress.

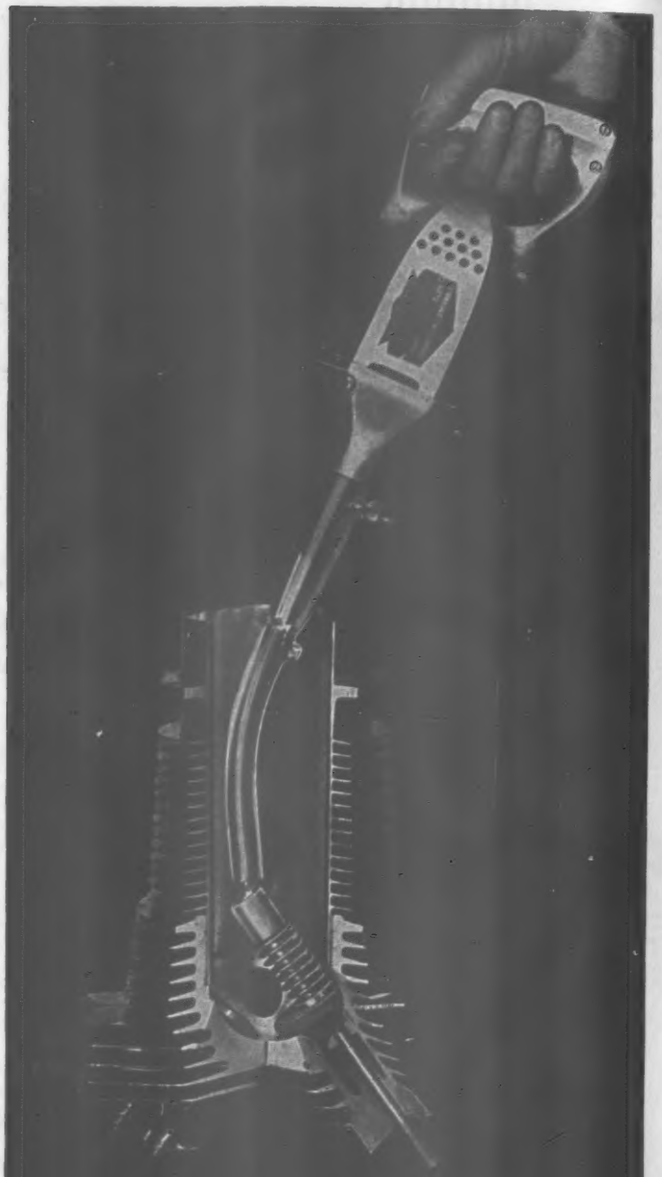
The men who will carry forward America's splendid aviation traditions will find in this record of technical advancement—of almost insurmountable difficulties overcome—much of inspirational value and permanent interest.

For all American readers the August issue will, we believe, record an epic of accomplishment of which they may well be proud.

AVIATION *for August*

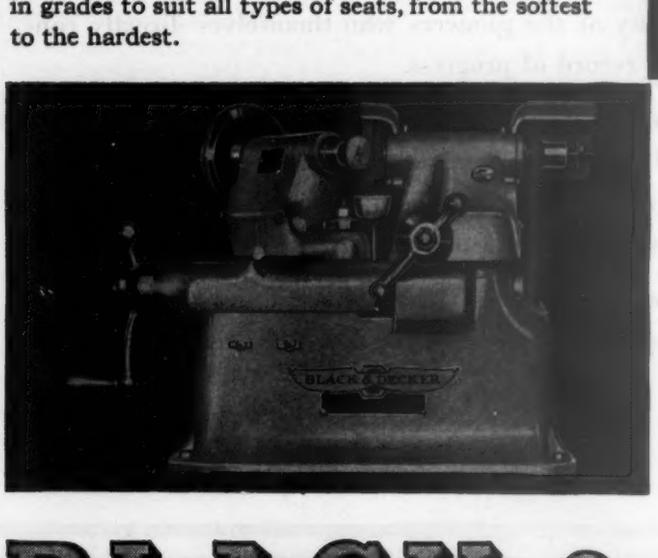
NEW
BLACK & DECKER
Vibro-Centric
Valve Seat Grinder for Aircraft Engines

saves several hours on every motor overhaul



HERE is a new, faster and far more accurate method of reconditioning valve seats in all types of aircraft engines. Removing a minimum of metal, Vibro-Centric quickly produces a smooth, highly polished seat, with the accuracy specified by aircraft engine manufacturers.

A self centering pilot in the valve guide assures perfect centering of the grinding stone. And the high spindle speed of the driving unit (12,000 R.P.M.) is combined with an automatic vibrating action which both increases the grinding speed and minimizes loading of the stones. The angle drive easily reaches down into the cylinder, keeping the driving unit outside and eliminating the possibility of scoring the cylinder walls. Stones are available in grades to suit all types of seats, from the softest to the hardest.



New Refacer Handles All Types of Aircraft Engine Valves

Black & Decker's new Universal Super-Service Valve Refacer quickly puts a new, true-fitting face on any airplane, auto, bus, truck or tractor valve, of any stem diameter from 5/16" to 11/16", at any angle from 15° to 90°. A precision machine in every way, it combines with the Vibro-Centric Grinder in turning out aircraft valve work of the highest accuracy.

Ask your jobber to demonstrate Vibro-Centric and the new Super-Service Refacer. And write for our catalog describing our complete line of drills, screw drivers, nut runners, tappers, portable grinders, bench grinders, sanders, etc. The Black & Decker Mfg. Co., 738 Pennsylvania Avenue, Towson, Maryland.

BLACK & DECKER

World's Largest Manufacturer of

PORTABLE ELECTRIC TOOLS

EMERGENCY

NO MATTER how well organized an airport may be, emergencies always arise. Equipment to meet them cannot be purchased when it is needed. It must be kept on hand and kept in proper condition for use at all times. This type of equipment falls into three general categories—fire-fighting apparatus and materials, emergency tools, and first aid equipment.

Long experience in industry has qualified the manufacturers of fire-fighting equipment to recommend the type of apparatus needed for a given problem. Fires in general fall into three classes. The Class A fire in wood, paper, textiles, rubbish or similar materials, can be extinguished by cooling or quenching, but this method is not always desirable because of the resulting water damage. Chemical types of extinguishers are now available to do the job without the water damage which often exceeds the fire loss. Class B fires in gasoline, oils, grease, etc., are extinguishable by smothering or blanketing. Most serious of all are the Class C electrical fires which are best handled by the various chemical extinguishing mediums which are non-conductors of electricity. Extinguishing mediums have been developed to handle this type of fire with a minimum damage to the equipment involved.

Since any fire is extinguishable in its early stages, detecting and alarm systems are a vital necessity in any complete plan of fire control. Built-in sprinkler systems because of their automatic detection features should be given consideration in the design of any building housing aircraft. Miscellaneous emergency equipment is usually kept in kits or in crash trucks and includes such items as rope, bolt cutters, metal and wood cutting saws, crowbars, sledge-hammers, asbestos suits, etc.

There is an almost unlimited quantity of first aid equipment on the market. A recent development of high value to airports is the unit type of kit which can be furnished by all suppliers of industrial first aid equipment. This system provides individual dressings which can be readily handled by the most inexperienced layman. Each sealed unit contains materials for one or more complete emergency treatments and each dressing is complete in itself, having sufficient material to handle a single injury. Units are systematically arranged in convenient rows, each one being readily identified. Contents of kits can be arranged on the basis of hazards expected.

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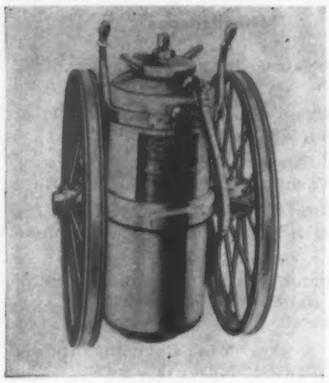

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Fire Extinguishers

American LaFrance & Foamite Corporation, Elmira, N. Y. (2)
Badger Fire Extinguisher Company, Park Square Bldg., Boston, Mass.
C-O-Two Fire Equipment Company, Pyrene Bldg., Newark, N. J.
Fyr-Fyter Company, Dayton, Ohio (1)
Garrison Engineering Corporation, Waterbury, Conn.
General Fire Truck Corporation, Forest Park Blvd., St. Louis, Mo.
Walter Kidde & Company, 140 Cedar St., New York City (3)
The Phister Manufacturing Company, 621 East Pearl St., Cincinnati, Ohio
Pyrene Manufacturing Company, 560 Belmont Ave., Newark, N. J.
Stempel Fire Extinguisher Manufacturing Company, 20th and Ferry Streets, St. Louis, Mo.
Washington Equipment Corporation, Washington, D. C.

First Aid Equipment

Bauer & Black, 2500 South Dearborn St., Chicago, Ill.
E. D. Bullard Company, 275 8th St., San Francisco, Cal.
Burroughs Wellcome & Company, Inc., 9-11 E. 41st St., New York City. (4)
Davis Emergency Equipment Company, Inc., 55 Vandam St., New York City.
Johnson & Johnson, New Brunswick, N. J.
Mine Safety Appliance Company, Pittsburgh, Pa.
Seabury & Johnson, 222 4th Ave., New York City.
M. L. Snyder & Son, 3rd and Arch Sts., Philadelphia, Pa.

MISCELLANEOUS

AIRPORT equipment in its broadest sense covers a lot of territory. In any discussion of it, it would be proper to include farm and highway machinery, building materials of all kinds, furnishings for office buildings and homes, electrical equipment, and a large number of specialties. The more important of these classifications have been covered elsewhere in this issue. The more universally used items of equipment must be passed over here for lack of space. High spots of the intermediate class of equipment are treated here.

In the category of shop equipment, is a wide variety of machine tools, motors, motor generators, switchboards and other material of general application. For particular airport use there are a number of maintenance devices that have special aeronautical application. For cleaning engine parts, completed engine, wings, and other airplane parts, the Hypressure Jenny has decreased the cleaning time in a number of repair shops. This device is a chemical vapor spray cleaning machine by which it is possible to apply a combination of heat, pressure, and cleaning compound to remove dirt and grease accumulations. A variety of chemical cleaning compounds for various purposes are on the market.

A number of airports have found use for oil reclamation apparatus and where the airport activity is not sufficient to keep an oil purifier busy, it is always possible to take in laundry work for garages and automobile service stations.

Miscellaneous

Air Associates, Inc., Roosevelt Field, L. I., N. Y.

Air Reduction Sales Company, (welding supplies), 60 East 42nd St., N. Y. C.

American Airport Equipment Company, 5958 Washington Blvd., Chicago, Ill.

John Bean Mfg. Company (Battery Chargers), 217 W. Julian St., San Jose, Calif.

Binks Manufacturing Company (paint spray equipment), 3114 Carroll Ave., Chicago, Ill.

Black & Decker Mfg. Company (power tools), Towson, Md.

E. D. Bullard Company (Sirens), 275 8th St., San Francisco, Calif. (2)

Burton-Rogers (Battery Chargers), Boston, Mass.

DeVilbiss Company (paint spray equipment), Toledo, Ohio.

Engineering & Research Corporation (machine tools), Washington, D. C.

Ex-Cell-O Aircraft & Tool Corporation (machine tools), 1200 Oakman Blvd., Detroit, Mich.

Julian P. Frieze & Sons, Inc. (weather instruments), Baltimore, Md. (3)

General Electric Company, Schenectady, N. Y.

Heald Machine Company (grinders), Worcester, Mass.

Hobart Bros. Company (battery chargers), Troy, Ohio.

Homestead Valve Manufacturing Company (Hypressure Jenny), P. O. Box H, Coraopolis, Pa.

Independent Pneumatic Tool Company (power tools), 600 West Jackson Blvd., Chicago, Ill.

Linde Air Products Company (welding supplies), 205 East 42nd St., N. Y. City.

The Alexander Milburn Company (paint spray equipment), 1416 West Baltimore St., Baltimore, Md.

Nicholas-Beazley Airplane Company, Marshall, Mo.

Paasche Air Brush Company (paint spray equipment), Chicago, Ill.

A. Schrader's Son, Inc. (compressed air equipment), Brooklyn, N. Y.

Skilsaw, Inc. (power tools), 3310 Elston Ave., Chicago, Ill.

Skinner Purifiers, Inc. (oil filters), 2231 Dalzelle St., Detroit, Mich.

Smith Welding Equipment Corporation, 2633 4th St. S. E. Minneapolis, Minn.

South Bend Lathe Works (machine tools), South Bend, Ind.

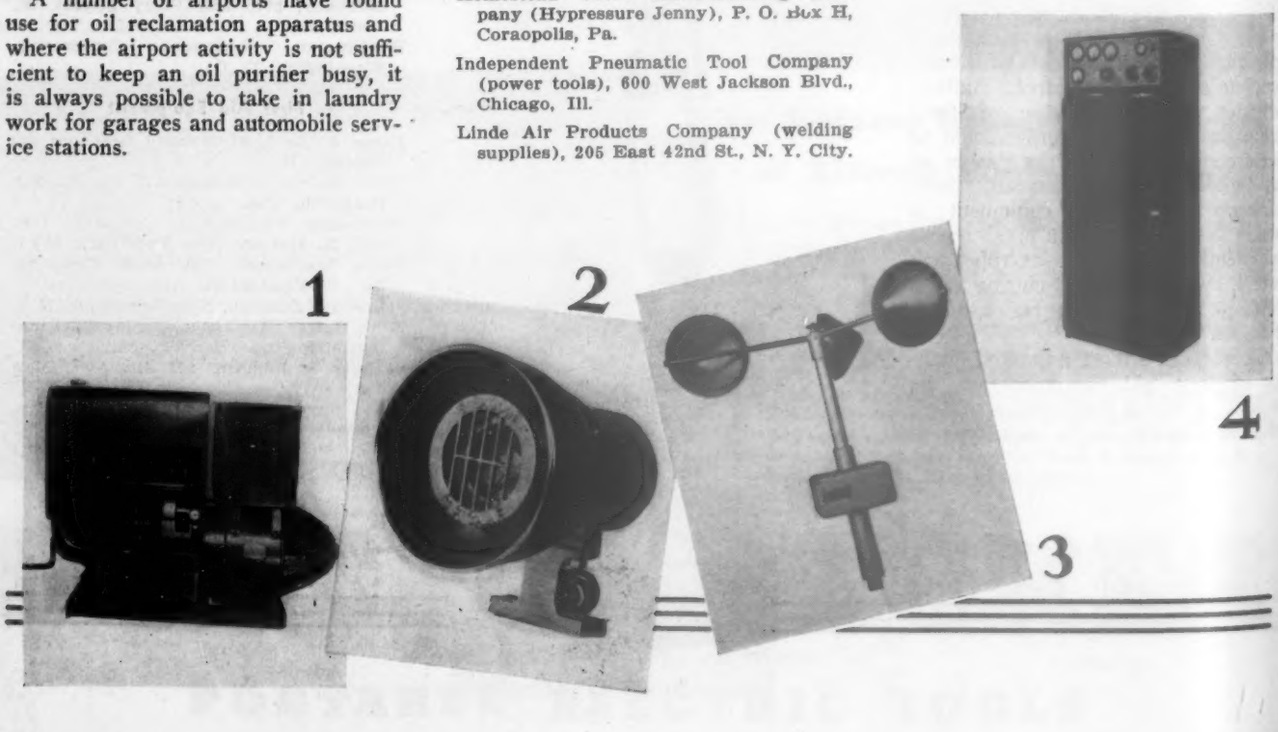
The Stanley Works (tools and hardware), Lake St., New Britain, Conn.

Taylor Instrument Companies (weather instruments), Rochester, N. Y.

Union Carbide & Carbon Corporation (welding supplies), 30 E. 42nd St., N. Y. C.

Weston Electrical Instrument Company (weather instruments), 614 Frelinghuysen Ave., Newark, N. J.

Westinghouse Electric & Mfg. Company (weather instruments, battery chargers, etc.), East Pittsburgh, Pa. (1), (4)

S. S. White Dental Manufacturing Company (power tools), 10 E. 40th St., N. Y. C.

Yale & Towne Manufacturing Company (hoists, etc.), Philadelphia, Pa.